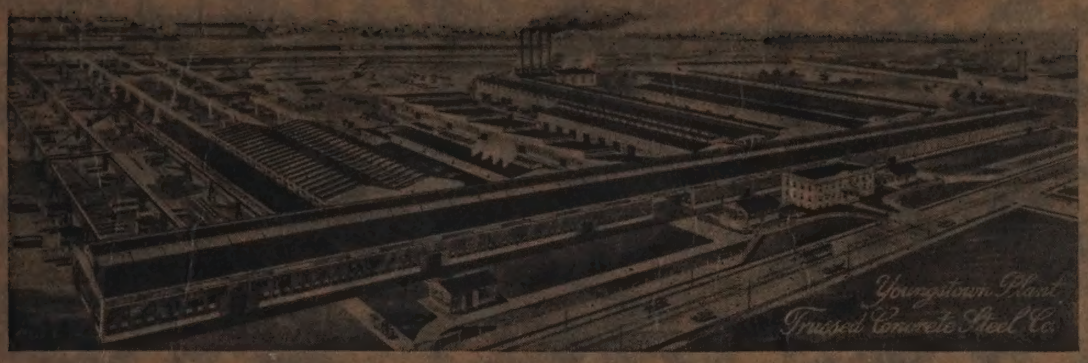


UNITED STEEL SASH

TRUSSED CONCRETE STEEL CO
YOUNGSTOWN OHIO U S A

UNITED
STATES
SASH

PART ONE OF HAND BOOK OF UNITED STEEL SASH

PIVOTED TYPES

of

UNITED

STEEL

SASH

STOCK—SEMI-STOCK—TO-ORDER

EIGHTH EDITION

1 9 1 7

Copyright, 1912, 1913, 1915, 1917

Trussed Concrete Steel Co.

KAHN Building Products
TRUSSED CONCRETE STEEL CO

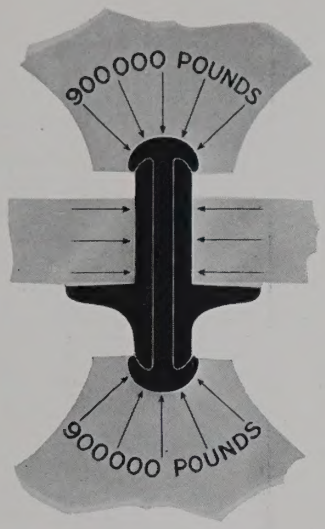
Trussed Concrete Steel Co.

Youngstown, Ohio, U. S. A.

The Printing Crafts Building, Eighth Avenue, 33rd and 34th Streets, New York City. Edward L. Larkins, Architect.

All the windows, including three street elevations, of this large New York Skyscraper are Pivoted United Steel Sash—another striking testimonial to their superior construction, workmanship and quality.

Features of United Steel Sash



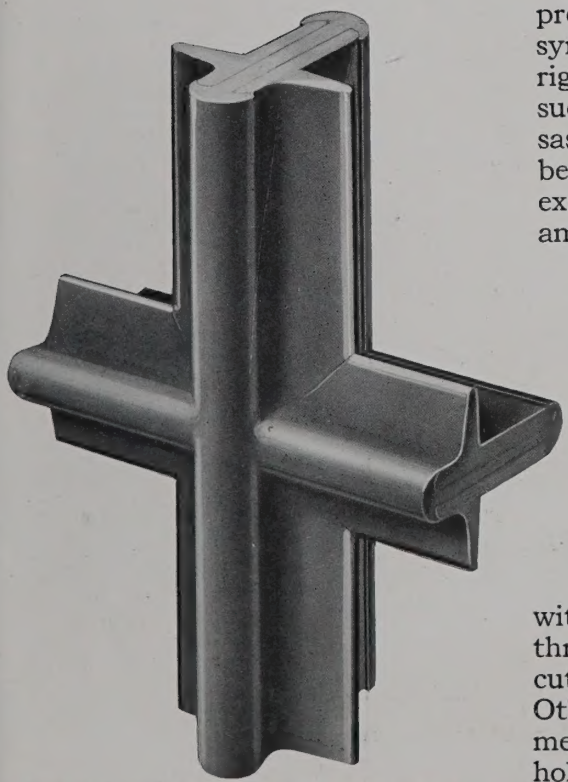
Cold Welding of United Steel Sash Section under pressure of 450 tons

In modern buildings requiring maximum daylight, perfect ventilation and greatest permanency, United Steel Sash are an essential feature of the construction. The day of wooden sash is past, because their wide members shut out the daylight and the material is short-lived and inflammable, spreading the fire instead of retarding it. With United Steel Sash, buildings are flooded with daylight and are fireproof and permanent to the highest degree.

United Steel Sash are low in cost and in the majority of cases can be installed as cheaply as wooden sash. The economy and actual money-saving in United Steel Sash, which are proof against fire and decay, should appeal to all builders.

Greatest Strength and Weight

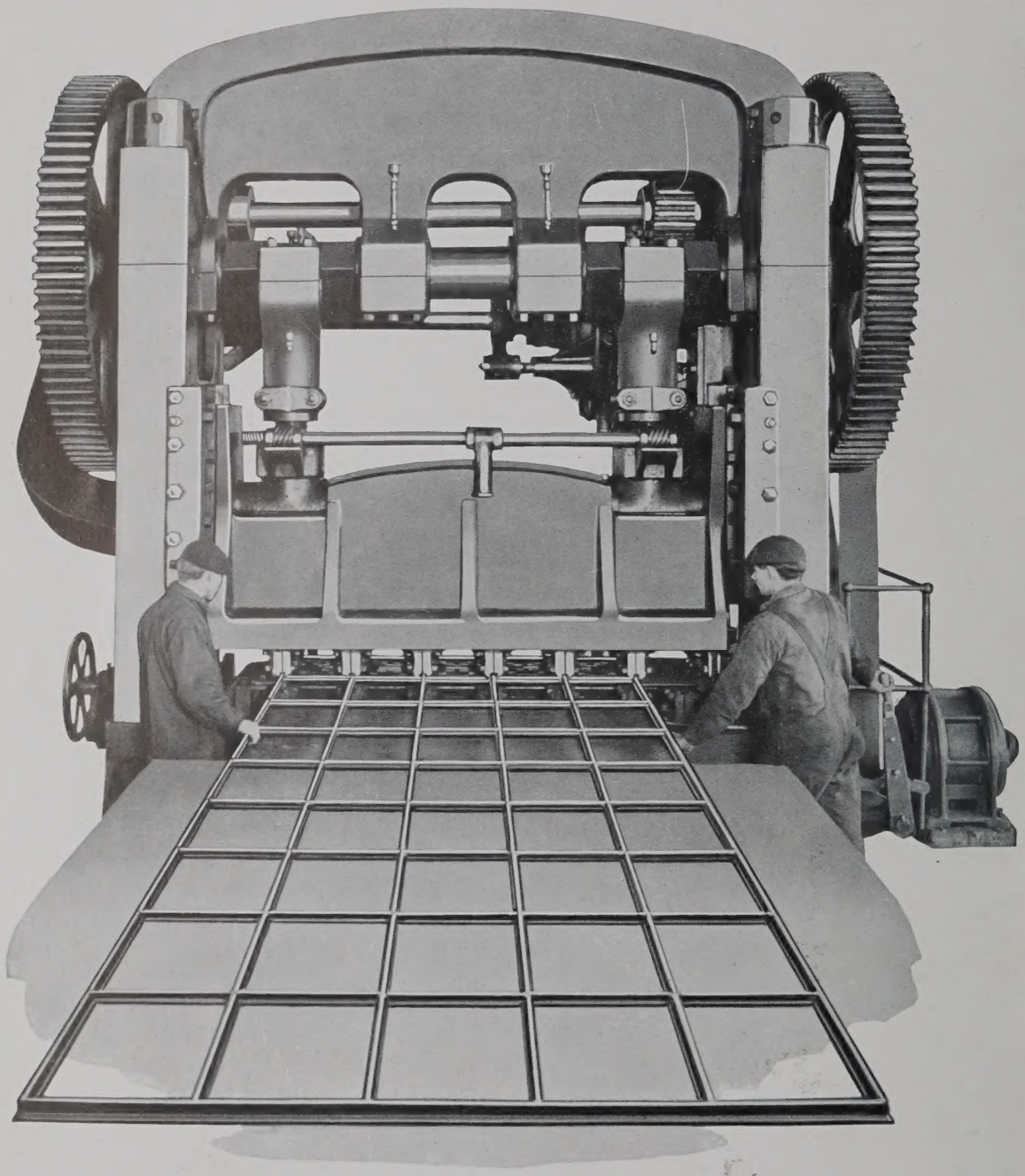
United Steel Sash are made of rolled sections of the highest grade of steel. These sections are cold welded under powerful presses (see photograph of press on next page) to form deep, narrow symmetrical members, giving greatest possible rigidity against direct wind pressure and the suction of passing air currents. Other forms of sash can not have this same strength and rigidity because their sections are unsymmetrical with an excess of metal on one side and an insufficient amount on the other.



Section through joint of United Steel Sash showing Continuous I-Beam and Glazing Sections

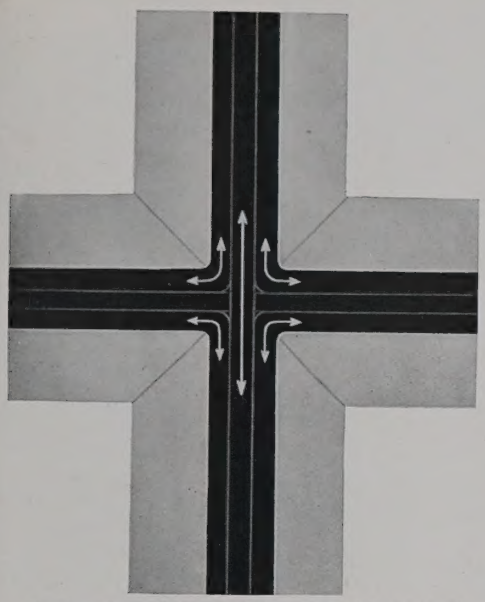
Under this tremendous pressure of 900,000 pounds, the entire sash is as intimately united as if it were one piece of molded steel, with the full strength of all members developed at every point. Exhaustive tests prove conclusively that the metal in each member will break in two, without developing any weakness in this cold welded connection.

The members of United Steel Sash are built with I-Beam sections, which extend continuously throughout their length, and are not weakened by cutting out or punching of the metal at the joints. Other types of sash are materially weakened by the method of assembling, which consists of cutting holes in the sections and passing the members through one another.



One of the Many Gigantic Presses Used in Manufacturing United Steel Sash

This press weighs 120,000 lbs. and strikes a blow of 450 tons at each operation

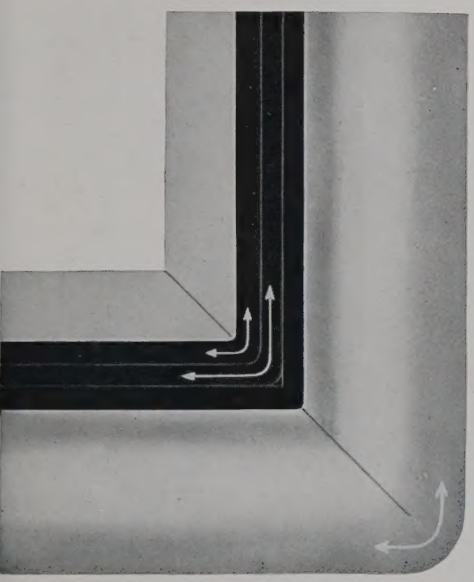


Section through joint of United Steel Sash showing Continuous I-Beam and Glazing Sections

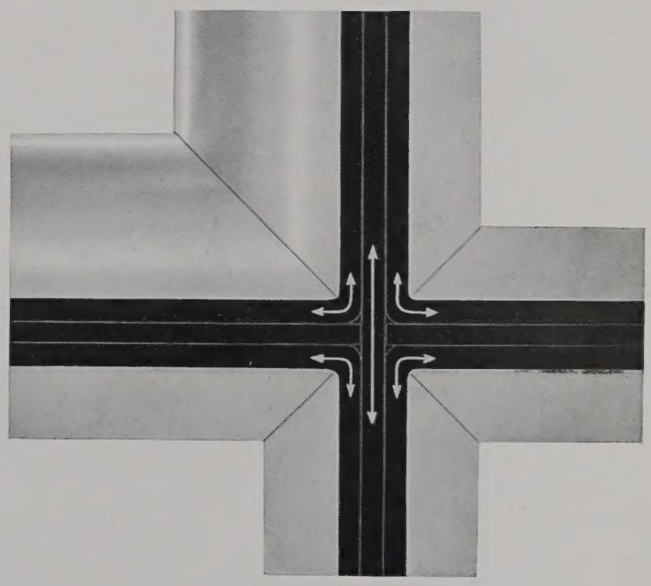
The bearing section for the glass is mitered at the corners and extends continuously around each pane, being cold welded to the I-Beam sections under a pressure of four hundred and fifty tons. Each and every mitered joint is stiff and rigid in itself, and the combined rigidity of all of these mitered joints together with the continous sections give the sash exceptional stiffness against deformation during shipment and erection, assuring the true alignment of the members and the perfect operation of the ventilators.

The frames of the pivoted ventilator and of the fixed portion of the sash into which it closes are made extra strong and heavy so as to provide exceptional rigidity. The ventilators bear evenly and hold tight under all conditions. The I-Beam glazing, and weathering sections extend continuously around the ventilator and frame, stiffening them against distortion and assuring perfect weather-tight contact.

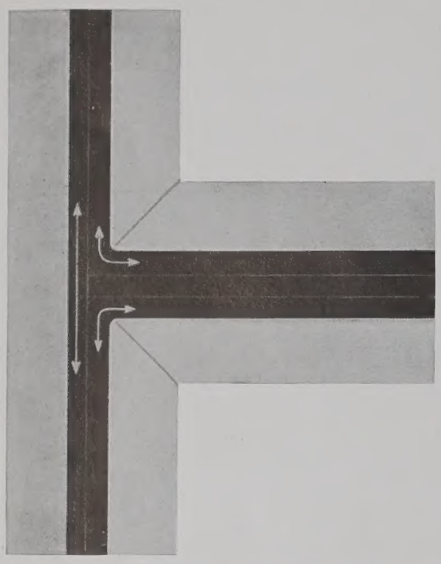
The sections around the sash extend continuously on each side of the frame and are not weakened by punching at the connections with muntin bars. These continuous sections are cold welded to the muntins by the continuous glazing sections under heavy pressure. There is no unprotected riveting on the outside of the frame to corrode and weaken the sash. The glazing sections extend continously around the four corners of the sash, and are cold welded to the outside frame, providing a strong rigid connection in addition to the substantial mortise and tenon at these points. The illustrations



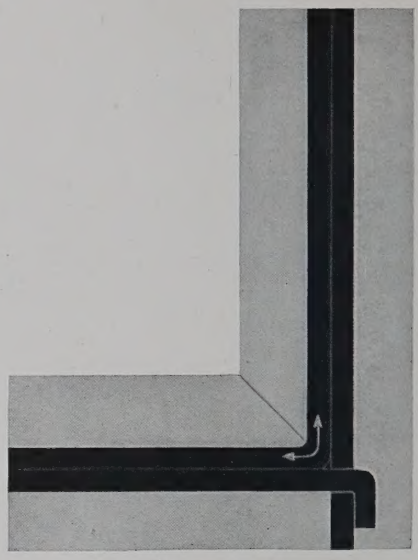
Section through corner of ventilator showing continuous sections around corner



Section through corner of joint of United Steel Sash at ventilator



Section of joint at outside frame, showing continuous glazing and outside sections. No riveting required



Section at corners of sash frame showing continuous glazing section and substantial mortise and tenon

show the rigid, continuous connections at the sides and corners of the outside frame.

In addition to the superior design and construction of the United Steel Sash, sections of proper weight are used to withstand the strain coming upon the sash, both during installation and in actual service.

Because of these exclusive features, United Steel Sash offer a stiffness against pressure and deformation 50% to 100% greater than other steel sash.

United Steel Sash must, therefore, of necessity command a higher price both because of the additional material which is furnished as well as the higher grade of workmanship, finish, design and equipment.

Superior Weathering

A window must not only let in maximum daylight, but must also shut out all storms and weather. This feature has had thorough consideration in the design of every type of United Steel Sash. The ventilators have all been provided with extra heavy frames so that they will remain tightly shut under all conditions of wind and storm. The double-contact weathering effectively shuts out driving rains and drafts. The locking devices and hardware, specially made in our own shops, keep the ventilators tightly closed. The superior method of manufacture of United Steel Sash under powerful presses makes them absolutely weather-tight at every point.

Finest Workmanship

United Steel Sash are machine-built with multiple dies and are of necessity absolutely accurate and uniform throughout. These dies are operated by powerful presses

which exert 450 tons pressure. Each joint is neatly mitered and carefully finished with pneumatic hammers. Where necessary, connections are welded under acetylene flame. The sash are carefully inspected at each step of their manufacture as well as before shipment. The finish of the sash is high-grade in all respects and in thorough keeping with high-class building materials generally. The high quality of the sash is evident by their clean-cut lines and attractive appearance after installation in the building.

Large Variety of Special Rolled Sections

Pages 17, 27 and 53 to 57 show the large variety of special rolled steel sections for use in the manufacture of the many types of United Steel Sash. Each section is designed to most efficiently meet a special requirement. All sections are manufactured and rolled for their particular uses without resorting to makeshift materials such as using light pressed sheet metal, light structural shapes, etc.

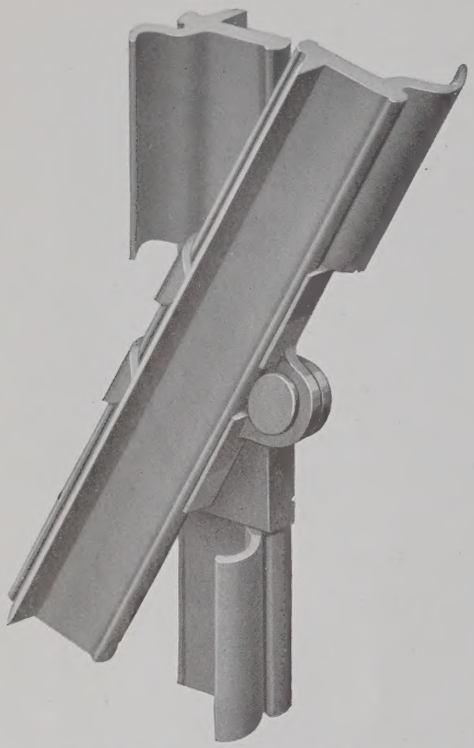
The same high quality of manufacture is employed for all types of United Steel Sash. The large number of special sections and their interchangeability offer a wide range of design and flexibility in the manufacture of the many types of United Steel Sash.

Special Hardware of Our Own Manufacture

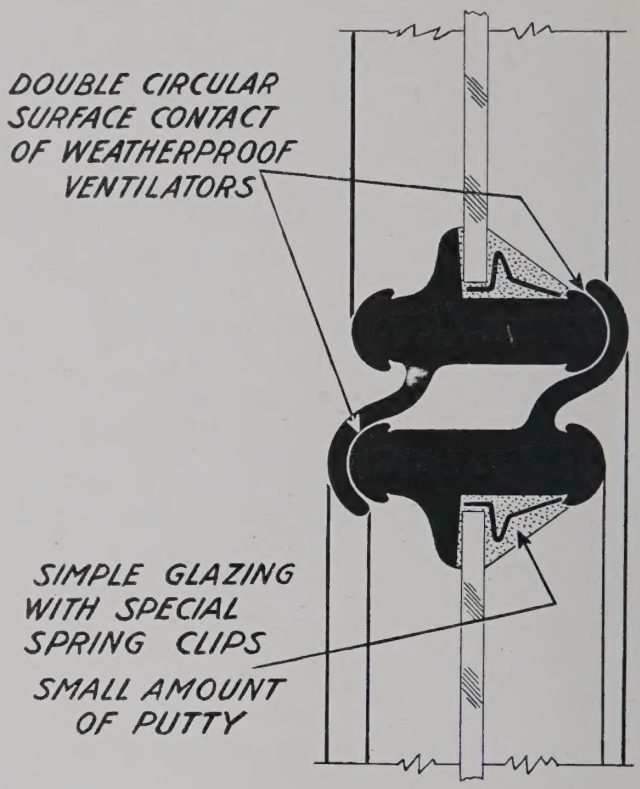
A special department of our large plant at Youngstown, Ohio, is devoted exclusively to the design and manufacture of hardware for United Steel Sash. We have found this necessary in order to perfectly meet the requirements of steel sash installations, as ordinary builder's hardware is not of sufficient strength or proper design for this purpose. This hardware is manufactured of the finest material and is of design and weight to perfectly operate and lock the sash. This hardware is designed and made exclusively for United Steel Sash. The choice of hardware to meet individual requirements is very large, in fact so much so that we have found it necessary to issue a special catalog on this subject alone. We illustrate on pages 25, 49, 50, 51 and 78 to 85 the most generally used types of hardware. For other types to meet special requirements, write to us for special catalog and detailed information.

Service of Sash Specialists

Our sash specialists have devoted many years to the development of improved designs of steel sash, and their application to all conditions of building construction. These men have had wide experience in this field and can therefore make recommendations of the proper sash to obtain the maximum utility from your building. We are glad to have you call upon these specialists to assist you in designing special sash to meet your particular conditions. We aim to co-operate fully with owners, architects, engineers and contractors, and to render maximum service to them. Our representatives are located in all principal cities and are ready to give direct personal service so essential to successful building construction. Call on us for estimates, suggestions and detailed advice.



Improved Pivot of United Steel Sash Ventilator


DOUBLE CIRCULAR SURFACE CONTACT OF WEATHERPROOF VENTILATORS
SIMPLE GLAZING WITH SPECIAL SPRING CLIPS
SMALL AMOUNT OF PUTTY

Section Around Ventilator

Remarkable Strength of United Steel Sash. Eight men balanced on Ventilator.

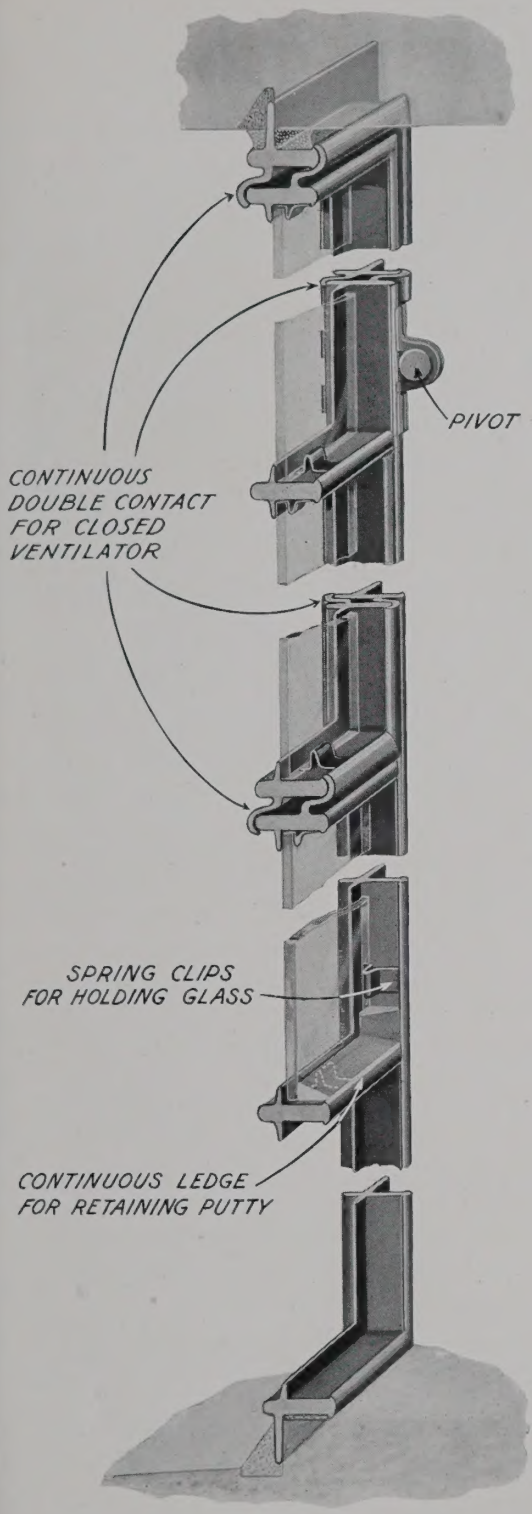
Pivoted Ventilators

The pivoted ventilators of side wall sash represent a marked improvement in steel sash design. The curved mouldings around the ventilator frame completely cover the opening joints, and the double circular surface contacts make the closed ventilator absolutely weatherproof. There is a full 7/8" surface contact completely around the ventilator frame.

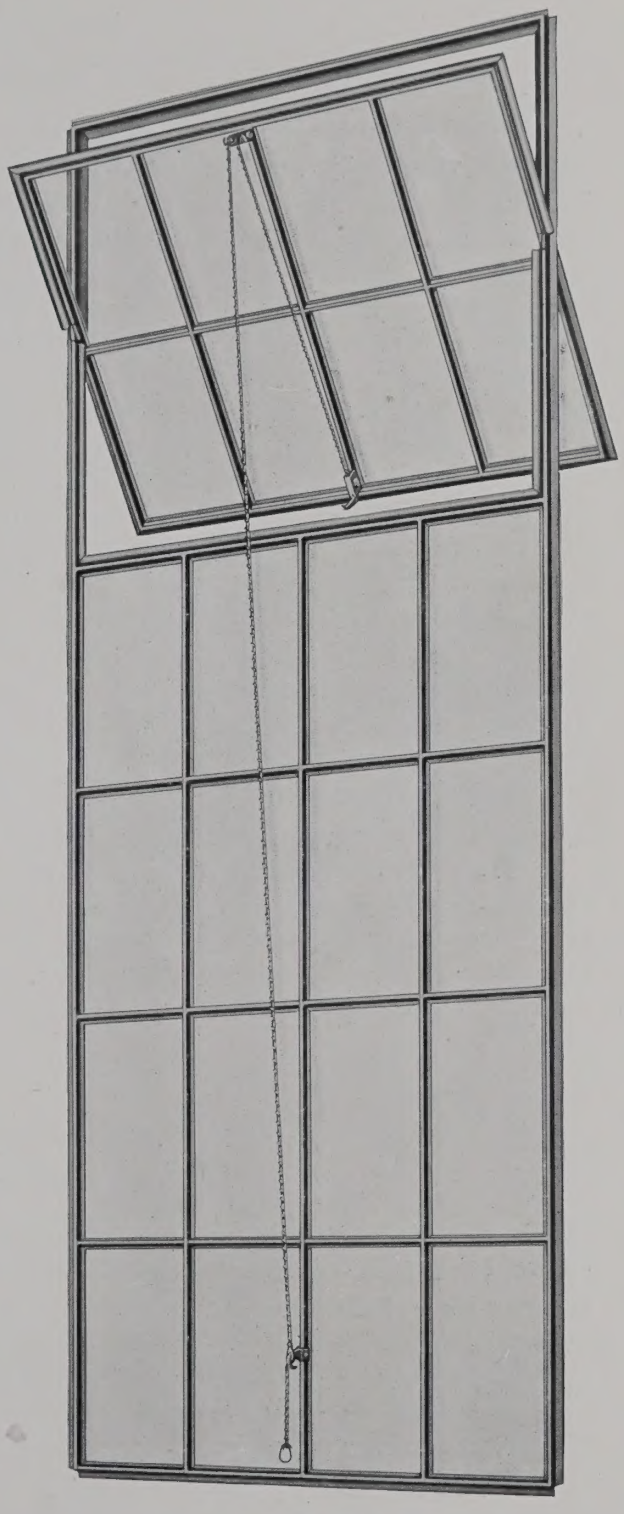
The heavy moulding stiffens the ventilator and keeps it true and rigid, so that the ventilator when closed bears tightly at all points against the moulding of the fixed portion of the sash. Large pivoted ventilators are possible in United Steel Sash, owing to their great strength, which is clearly demonstrated in the accompanying photograph.

The United Steel Sash pivoted ventilators are fitted with strong, neat appearing, rolled steel pivots.

The hardware for operating this type of ventilator is of neat and attractive design, perfect in every detail. Photographs of types of hardware supplied with these ventilators are shown on pages 25, 49, 50, 51 and 78 to 85 inclusive. For other types of hardware see Special Hardware Catalogue.


PIVOT
CONTINUOUS DOUBLE CONTACT FOR CLOSED VENTILATOR
SPRING CLIPS FOR HOLDING GLASS
CONTINUOUS LEDGE FOR RETAINING PUTTY

Vertical Section



Sash Type 64-1-8-4

Pivoted United Steel Sash

Maximum Daylight

With United Steel Sash the entire area of window opening is available for lighting. There is practically no obstruction to the light at the muntins, mullions, lintels or jambs. The deep, narrow, symmetrical sections of United Steel Sash offer a striking contrast to the wide, light-obstructing members of the ordinary wooden and many metal frames.

Daylight interiors with United Steel Sash are the greatest economy in factory construction, increasing the quantity of the output and improving its quality. Daylighting reduces scrap piles, increases the available working space and cuts down lighting bills.

United Steel Sash flood the interior with daylight, and lighten up the dark corners where filth and waste materials accumulate in dimly lighted factories. Daylight exposes these rubbish piles and improves the sanitary conditions. Full efficiency of every workman is assured.

Ample Ventilation

With United Steel Sash the maximum amount of ventilation can be obtained, as the large ventilators can be designed to meet every requirement. The various methods of ventilation available are shown on the pages devoted to the stock, semi-stock and to-order types of pivoted sash. All arrangements of horizontally and vertically pivoted ventilators can be secured. Good ventilation promotes activity and industry in workmen, and is assured by the use of United Steel Sash.

Subject to Severest Strains

Under conditions of severest exposure for many years in numerous installations, United Steel Sash continually demonstrate their strength, durability and resistance to storms, fire and the elements. Repeated tests by public bureaus, such as the Underwriters Laboratories and the New York Labor Bureau; intense fires such as the Graves Building, Cleveland; exposure to corrosive ocean storms such as in the Bush Terminal Buildings, have all proven the excellence of design and workmanship of United Steel Sash. Great organizations such as the Thomas Edison Co. Inc., and the Massachusetts Institute of Technology have thoroughly investigated all makes of sash, and selected United Steel Sash because of their superiority. These indisputable facts are convincing reasons why United Steel Sash should be used in your buildings.

Photograph copyrighted by Thomas A. Edison

Mr. Thomas A. Edison (shown in circle) took a personal interest in this Fire Test on Steel Sash. The building shown was specially constructed by the Edison Co. to make this test.

Fire Test Decides Thomas A. Edison in Selecting United Steel Sash

Thomas A. Edison Co., Inc., scientifically investigated all makes of steel sash before making selection for refitting their plant. Many samples were thoroughly examined and compared. All were eliminated except two, one being United Steel Sash. No special sample was made up of United Steel Sash, a standard sash from another Edison building in course of construction being used.

A fire test was made by the Thomas A. Edison Co. on these two sash on February 3, 1915, in a special building constructed for the purpose. The two sash were built into opposite walls with the flames between them. The fire was of unusual severity, consisting of celluloid films and dry wood saturated with kerosene.

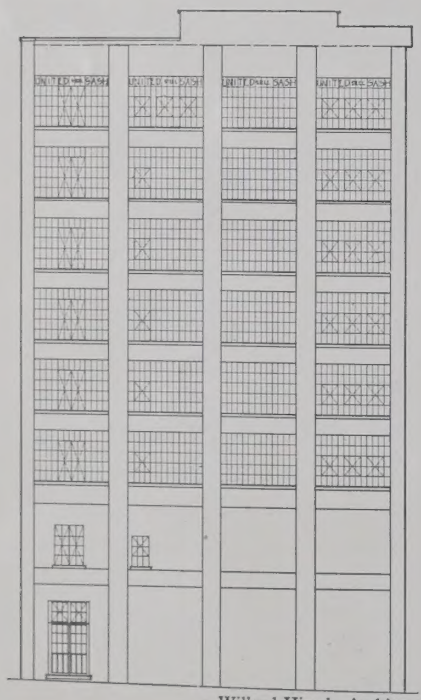
For one hour this roaring furnace burned. United Steel Sash remained intact throughout this ordeal, but in the other sash one light of glass gave away. A stream of water at high pressure was thrown against the two sash, without injury to the United Steel Sash, but with a loss of four more lights by the other sash.

United Steel Sash had thus demonstrated its superiority to the Edison Co., and was adopted for the refitting of their entire plant. Although higher in price, United Steel Sash was deemed the most economical because of its advantages.

Can you do anything better than follow the lead of the Edison Co., who studied the sash question from every angle and adopted United Steel Sash?

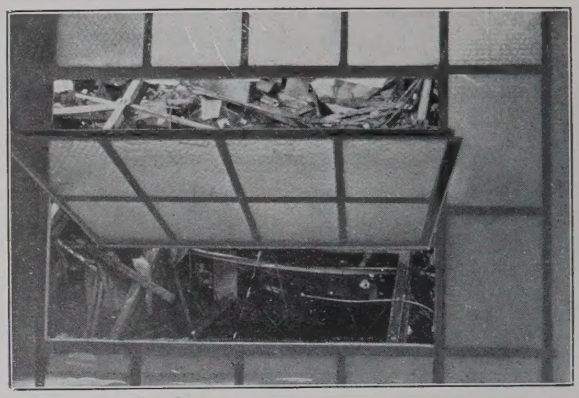
Photo by courtesy of Leader News, Cleveland, Ohio

Roaring fire destroys Graves Building while Sincere Building across 8-foot alley is safe behind windows of United Steel Sash and wire glass.



Willard Hirsch, Architect

North Elevation of the Sincere Building, showing large area of United Steel Sash exposed to roaring flames.



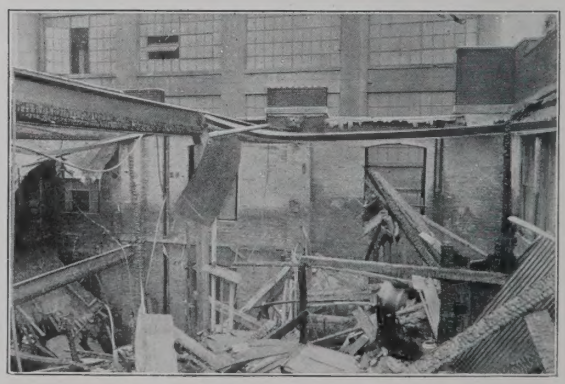
Looking through a United Steel Sash window across the narrow alley into the ruins of the Graves Building. Firemen fought the conflagration by directing streams through these windows.

Cleveland's Business District Saved by United Steel Sash.

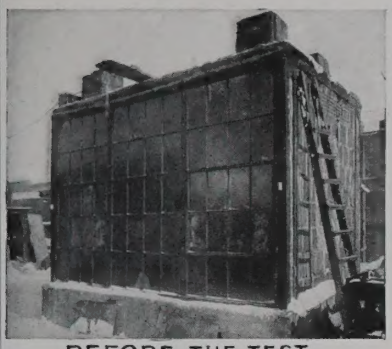
On the night of Oct. 17, 1915 the heart of Cleveland's business district was threatened by a fire which destroyed the six-story Graves Building. The fire was checked by the fireproof Sincere Building only 8 feet distant and exposed to the full sweep of the flames but secure behind United Steel Sash and wire glass. The Graves Building was a total loss while the Sincere Building was unharmed except for cracked wire glass.

Not a pane was broken through by the flames. The United Steel Sash are intact.

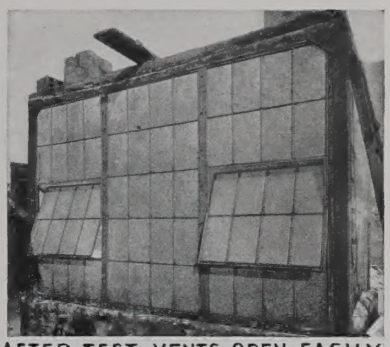
This fire shows forcibly how thoroughly United Steel Sash protect buildings and their contents from damage and destruction.



Amid the ruins of the Graves Building only the walls remained standing. In the background across the 8-foot alley are seen the United Steel Sash in the Sincere Building.

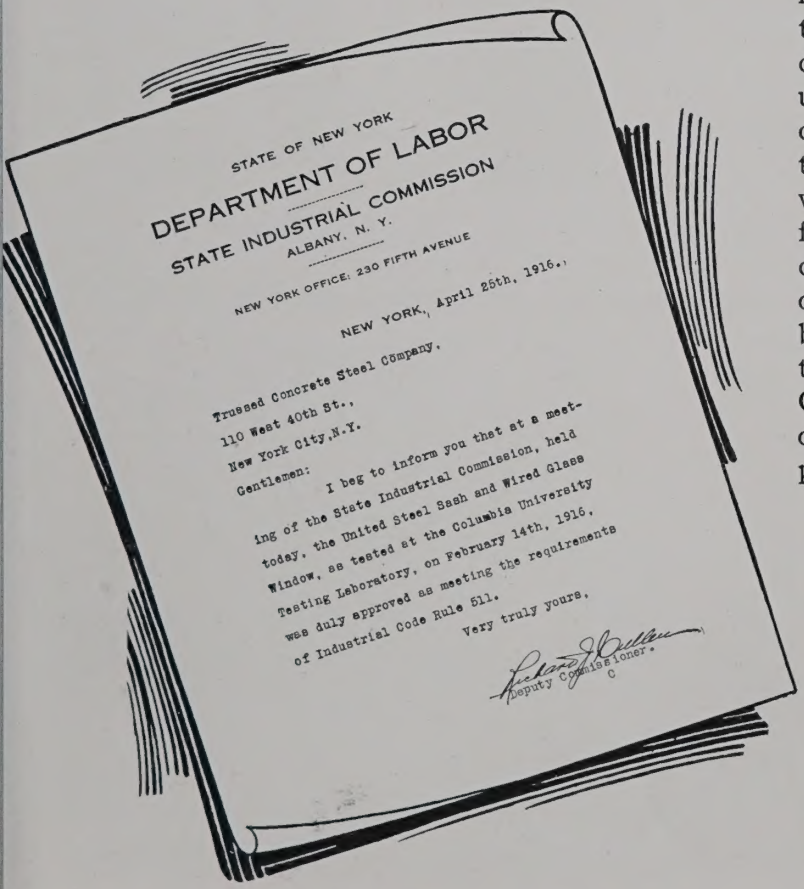

BEFORE THE TEST

DURING THE TEST


AFTER TEST-VENTS OPEN EASILY

United Steel Sash Tested and Approved by New York State Industrial Commission

This remarkable fire and water test on United Steel Sash was conducted at the Columbia University Testing Laboratory by James S. Macgregor, M. S. for the New York State Department of Labor. One entire side of the test house was formed of United Steel Sash. For one hour and twelve minutes (instead of forty-five minutes as required) the sash was subjected to an intense fire, reaching 1600 degrees during the last 15 minutes. Immediately a stream of cold water was directed against the sash. United Steel Sash withstood this severe ordeal perfectly without a pane of glass dropping out. The ventilators opened and closed as easily as before the test. As a result of the test, the State Industrial Commission of the Department of Labor gave its official approval to United Steel Sash.



STATE OF NEW YORK
DEPARTMENT OF LABOR
STATE INDUSTRIAL COMMISSION
ALBANY, N. Y.

NEW YORK OFFICE: 230 FIFTH AVENUE

NEW YORK, April 25th, 1916.

Trussed Concrete Steel Company,
110 West 40th St.,
New York City, N.Y.

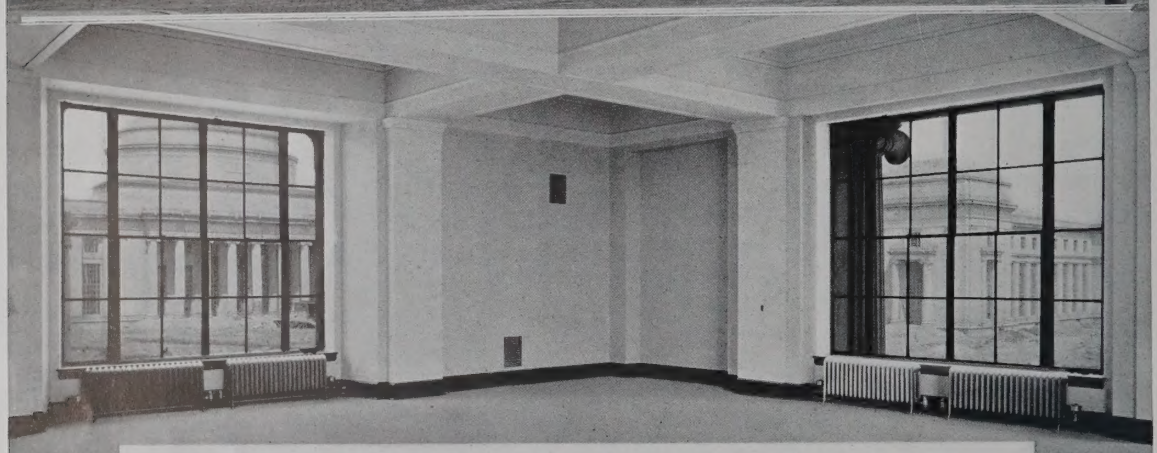
Gentlemen:

I beg to inform you that at a meeting of the State Industrial Commission, held today, the United Steel Sash and Wired Glass Window, as tested at the Columbia University Testing Laboratory, on February 14th, 1916, was duly approved as meeting the requirements of Industrial Code Rule 511.

Very truly yours,

Deputy Commissioner.

APPLYING WATER



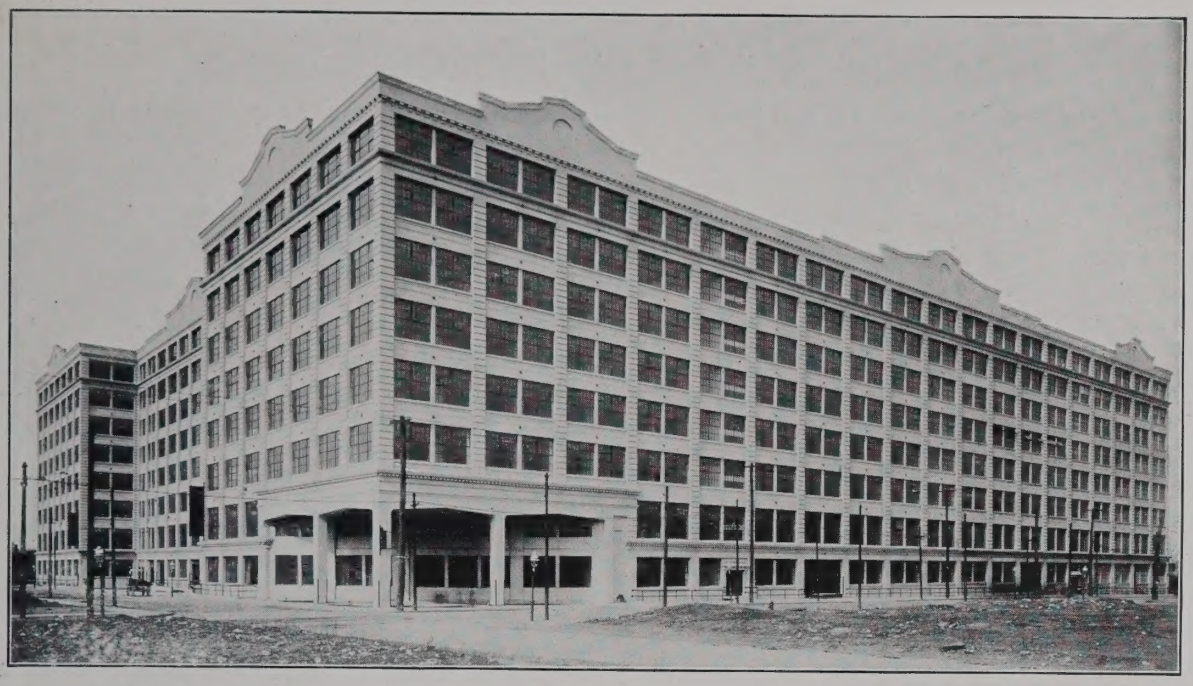
Massachusetts Institute of Technology Selects United Steel Sash

Overall Dimensions—800 x 700 ft. Floor Space—800,000 sq. ft. Cubic Contents—12,000,000 cu. ft. Window Area—110,000 sq. ft.

In the construction of its mammoth new buildings on the Charles River the Massachusetts Institute of Technology made its selection of materials with the care and thoroughness of a recognized engineering authority. For the 110,000 sq. ft. of window area, United Steel Sash were chosen as befitting a masterpiece of modern design and construction. The eighteen acres of floor space are assured maximum daylight by the use of United Steel Sash.

William W. Bosworth, Architect

Stone and Webster Engineering Corporation, Engineers and Contractors



Turner Construction Co., Contractors. Wm. Higgenson, Architect.

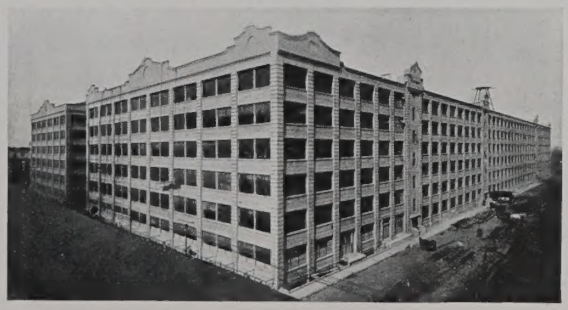
Buildings Nos. 19 and 20, Bush Terminal Co., Brooklyn, N. Y., Daylighted with United Steel Sash

United Steel Sash Exposed to Severest Ocean Storms in Bush Terminal Buildings

No more severe exposure test of sash could be found than in the Bush Terminal Co. buildings—the large, model industrial group in Brooklyn, N. Y. Here, located on the ocean front, the buildings are exposed to the continuous corroding action of the salty air and the tremendous wind pressure of severest storms. United Steel Sash were selected to meet these extreme conditions and have proven so satisfactory that they have been used in all recent buildings of the Bush Terminal Co.

This important installation demonstrates clearly the absolute permanence, weathering and strength of United Steel Sash. The steel sections have positively withstood the corroding effects of the salty, briny atmosphere. The heavy ventilator frames and double-contact weathering effectively shut out drafts and rain. The exceptional strength, due to the "I" beam sections and method of assembling, prevent distortion of the sash even in the severest storm.

Bush Terminal Buildings Nos. 9 and 10



Bush Terminal Buildings Nos. 5 and 6

Stock Units of Pivoted Sash

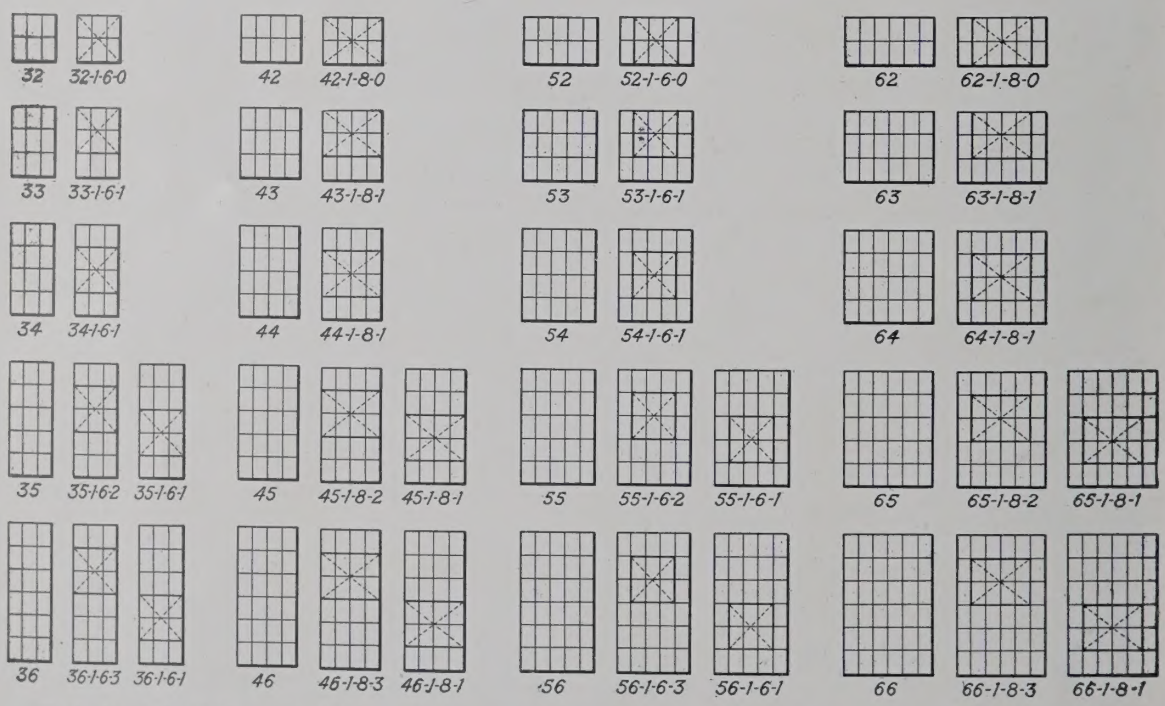
By manufacturing United Steel Sash in large quantities and keeping them in stock, we insure low manufacturing costs and prompt shipment. These stock sash are of the same high grade design, material and workmanship as described in the preceding pages.

The use of stock units of United Steel Sash insures for you the best sash at economical cost, quick shipments from warehouse stocks and the maximum speed in building construction. You standardize your window openings without sacrificing architectural effects.

The stock units of United Steel Sash have been selected so as to meet practically all building requirements. These sash include a complete choice of number of lights wide and high, and various arrangements of ventilators. In addition, each unit is furnished in two standard glass sizes: 12″ x 18″ and 14″ x 20″.

Forty-eight different types and ninety-six sizes of United Steel Sash are regularly carried in stock. By combining the units as indicated in the accompanying tables and diagrams, practically all sizes of window openings are accommodated.

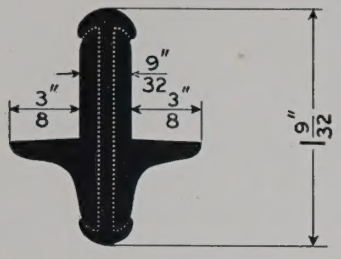
We shall continue to furnish our two other types of pivoted sash: Semi-Stock (see pages 26 to 51), in which the ventilators are carried in stock and the frames made to order; and To-Order (see pages 52 to 86) sash in all arrangements of horizontally and vertically pivoted ventilators.



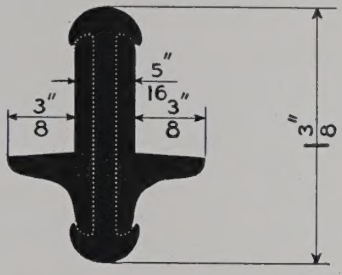
Each one of the 48 types of sash shown above is furnished in two glass sizes—12″ x 18″ and 14″ x 20″. These units are combined by mullions to meet all sizes of window openings as indicated on pages 18 and 19.

In combining units, one size of glass only should be used for any one opening, as of course 12″ x 18″ glass size cannot be used with 14″ x 20″.

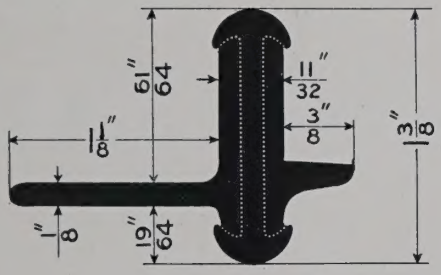
Ventilators are horizontally pivoted slightly above the center so as to insure automatic closing.



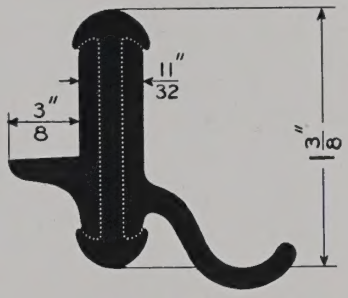
Nº 101 SECTION
Interior Horizontal Muntin



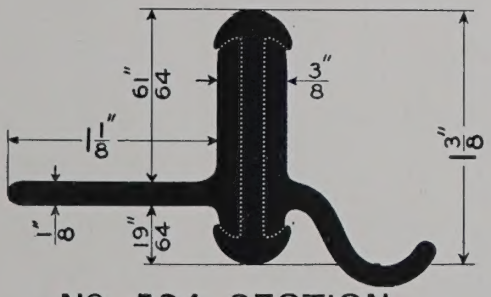
Nº 121 SECTION
Interior Vertical Muntin



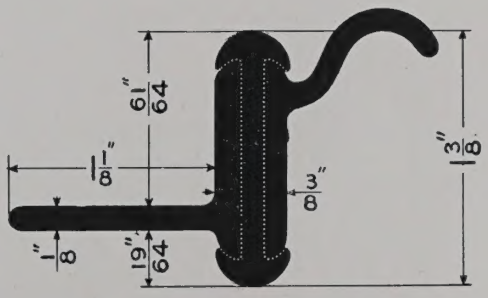
Nº 124 SECTION
(Nº 4 Regular)
Outside Section



Nº 125 SECTION
Interior Muntin at Ventilator



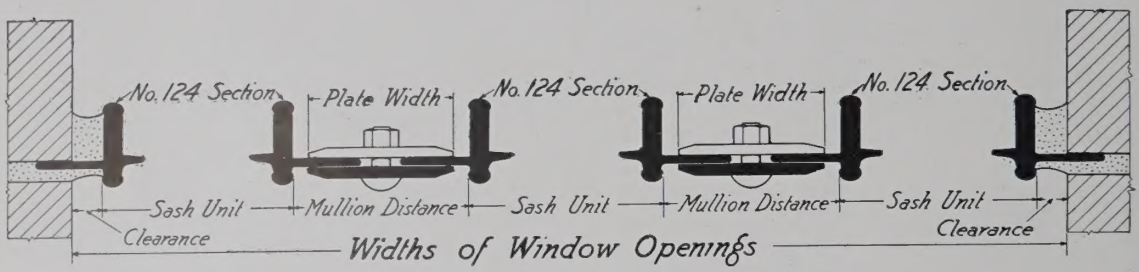
Nº 524 SECTION
(Nº 4 Regular)
Outside Section at Ventilator



Nº 524 SECTION
(Nº 4 Reversed)
Outside Section at Ventilator

Sections of Stock Units of United Steel Sash

Widths of Window Openings for Stock Sash



The following tables show the widths of window openings using various combinations of stock sash units with expandable mullions S—1, S—2, S—7, and S—8, illustrated on pages 20 and 21.

TABLE No. 1—12″x18″ GLASS

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide 1st Unit	2nd Unit	3rd Unit	4th Unit	Mull. Distance	Width of Mull. Plate	Clearance at Each Jamb.
3′-3″	3	1	3	....	....	....	....	....	9/16″
4′-3½″	4	1	4	....	....	....	....	....	9/16″
5′-4″	5	1	5	....	....	....	....	....	9/16″
6′-4½″	6	1	6	....	....	....	....	....	9/16″
6′-8″	6	2	3	3	....	....	3″	2½″	5/8″
6′-9″	6	2	3	3	....	....	4″	3″	5/8″
8′-9″	8	2	4	4	....	....	3″	2½″	5/8″
8′-10″	8	2	4	4	....	....	4″	3″	5/8″
10′-0½″	9	3	3	3	3	....	3″	2½″	7/16″
10′-1½″	9	3	3	3	3	....	3½″	3″	7/16″
10′-2½″	9	3	3	3	3	....	4″	3″	7/16″
10′-10″	10	2	5	5	....	....	3″	2½″	5/8″
10′-11″	10	2	5	5	....	....	4″	3″	5/8″
11′-1″	10	3	3	4	3	....	3″	2½″	7/16″
11′-2″	10	3	3	4	3	....	3½″	3″	7/16″
11′-3″	10	3	3	4	3	....	4″	3″	7/16″
12′-1½″	11	3	3	5	3	....	3″	2½″	7/16″
12′-2½″	11	3	3	5	3	....	3½″	3″	7/16″
12′-3½″	11	3	3	5	3	....	4″	3″	7/16″
12′-11″	12	2	6	6	....	....	3″	2½″	5/8″
13′-0″	12	2	6	6	....	....	4″	3″	5/8″
13′-2″	12	3	4	4	4	....	3″	2½″	7/16″
13′-3″	12	3	4	4	4	....	3½″	3″	7/16″
13′-4″	12	3	4	4	4	....	4″	3″	7/16″
13′-5½″	12	4	3	3	3	3	3″	2½″	½″
13′-7″	12	4	3	3	3	3	3½″	3″	½″
13′-8½″	12	4	3	3	3	3	4″	3″	½″
14′-2½″	13	3	4	5	4	....	3″	2½″	7/16″
14′-3½″	13	3	4	5	4	....	3½″	3″	7/16″
14′-4½″	13	3	4	5	4	....	4″	3″	7/16″
15′-3″	14	3	4	6	4	....	3″	2½″	7/16″
15′-4″	14	3	4	6	4	....	3½″	3″	7/16″
15′-5″	14	3	4	6	4	....	4″	3″	7/16″
15′-6½″	14	4	3	4	4	3	3″	2½″	½″
15′-8″	14	4	3	4	4	3	3½″	3″	½″
15′-9½″	14	4	3	4	4	3	4″	3″	½″

Continued on Next Page

TABLE No. 2—14″x20″ GLASS

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide 1st Unit	2nd Unit	3rd Unit	4th Unit	Mull. Distance	Width of Mull. Plate	Clearance at Each Jamb.
3′-9″	3	1	3	....	....	....	....	....	9/16″
4′-11½″	4	1	4	....	....	....	....	....	9/16″
6′-2″	5	1	5	....	....	....	....	....	9/16″
7′-4½″	6	1	6	....	....	....	....	....	9/16″
7′-8″	6	2	3	3	....	....	3″	2½″	5/8″
7′-9″	6	2	3	3	....	....	4″	3″	5/8″
10′-1″	8	2	4	4	....	....	3″	2½″	5/8″
10′-2″	8	2	4	4	....	....	4″	3″	5/8″
11′-6½″	9	3	3	3	3	....	3″	2½″	7/16″
11′-7½″	9	3	3	3	3	....	3½″	3″	7/16″
11′-8½″	9	3	3	3	3	....	4″	3″	7/16″
12′-6″	10	2	5	5	....	....	3″	2½″	5/8″
12′-7″	10	2	5	5	....	....	4″	3″	5/8″
12′-9″	10	3	3	4	3	....	3″	2½″	7/16″
12′-10″	10	3	3	4	3	....	3½″	3″	7/16″
12′-11″	10	3	3	4	3	....	4″	3″	7/16″
13′-11½″	11	3	3	5	3	....	3″	2½″	7/16″
14′-0½″	11	3	3	5	3	....	3½″	3″	7/16″
14′-1½″	11	3	3	5	3	....	4″	3″	7/16″
14′-11″	12	2	6	6	....	....	3″	2½″	5/8″
15′-0″	12	2	6	6	....	....	4″	3″	5/8″
15′-2″	12	3	4	4	4	....	3″	2½″	7/16″
15′-3″	12	3	4	4	4	....	3½″	3″	7/16″
15′-4″	12	3	4	4	4	....	4″	3″	7/16″
15′-5½″	12	4	3	3	3	3	3″	2½″	½″
15′-7″	12	4	3	3	3	3	3½″	3″	½″
15′-8½″	12	4	3	3	3	3	4″	3″	½″
16′-4½″	13	3	4	5	4	....	3″	2½″	7/16″
16′-5½″	13	3	4	5	4	....	3½″	3″	7/16″
16′-6½″	13	3	4	5	4	....	4″	3″	7/16″
17′-7″	14	3	4	6	4	....	3″	2½″	7/16″
17′-8″	14	3	4	6	4	....	3½″	3″	7/16″
17′-9″	14	3	4	6	4	....	4″	3″	7/16″
17′-10½″	14	4	3	4	4	3	3″	2½″	½″
18′-0″	14	4	3	4	4	3	3½″	3″	½″
18′-1½″	14	4	3	4	4	3	4″	3″	½″

Continued on Next Page

Widths of Window Openings for Stock Sash—Continued

TABLE No. 1—12″ x 18″ GLASS

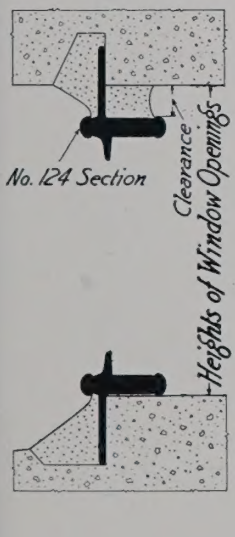
Continued from Preceding Page

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide				Mull. Distance	Width of Mull. Plate	Clearance at Each Jamb.
			1st Unit	2nd Unit	3rd Unit	4th Unit			
16′-3½″	15	3	5	5	5	....	3″	2½″	7/16″
16′-4½″	15	3	5	5	5	....	3½″	3″	7/16″
16′-5½″	15	3	5	5	5	....	4″	3″	7/16″
17′-4″	16	3	5	6	5	....	3″	2½″	7/16″
17′-5″	16	3	5	6	5	....	3½″	3″	7/16″
17′-6″	16	3	5	6	5	....	4″	3″	7/16″
17′-7½″	16	4	4	4	4	4	3″	2½″	½″
17′-9″	16	4	4	4	4	4	3½″	3″	½″
17′-10½″	16	4	4	4	4	4	4″	3″	½″
18′-4½″	17	3	6	5	6	....	3″	2½″	7/16″
18′-5½″	17	3	6	5	6	....	3½″	3″	7/16″
18′-6½″	17	3	6	5	6	....	4″	3″	7/16″
19′-5″	18	3	6	6	6	....	3″	2½″	7/16″
19′-6″	18	3	6	6	6	....	3½″	3″	7/16″
19′-7″	18	3	6	6	6	....	4″	3″	7/16″
19′-8½″	18	4	4	5	5	4	3″	2½″	½″
19′-10″	18	4	4	5	5	4	3½″	3″	½″
19′-11½″	18	4	4	5	5	4	4″	3″	½″
21′-9½″	20	4	5	5	5	5	3″	2½″	½″
21′-11″	20	4	5	5	5	5	3½″	3″	½″
22′-0½″	20	4	5	5	5	5	4″	3″	½″
23′-10½″	22	4	5	6	6	5	3″	2½″	½″
24′-0″	22	4	5	6	6	5	3½″	3″	½″
24′-1½″	22	4	5	6	6	5	4″	3″	½″
25′-11½″	24	4	6	6	6	6	3″	2½″	½″
26′-1″	24	4	6	6	6	6	3½″	3″	½″
26′-2½″	24	4	6	6	6	6	4″	3″	½″

TABLE No. 2—14″ x 20″ GLASS

Continued from Preceding Page

Width of Window Opening	Total No. of Lights Wide	No. of Units	Number of Lights Wide				Mull. Distance	Width of Mull. Plate	Clearance at Each Jamb.
			1st Unit	2nd Unit	3rd Unit	4th Unit			
18′-9½″	15	3	5	5	5	....	3″	2½″	7/16″
18′-10½″	15	3	5	5	5	....	3½″	3″	7/16″
18′-11½″	15	3	5	5	5	....	4″	3″	7/16″
20′-0″	16	3	5	6	5	....	3″	2½″	7/16″
20′-1″	16	3	5	6	5	....	3½″	3″	7/16″
20′-2″	16	3	5	6	5	....	4″	3″	7/16″
20′-3½″	16	4	4	4	4	4	3″	2½″	½″
20′-5″	16	4	4	4	4	4	3½″	3″	½″
20′-6½″	16	4	4	4	4	4	4″	3″	½″
21′-2½″	17	3	6	5	6	....	3″	2½″	7/16″
21′-3½″	17	3	6	5	6	....	3½″	3″	7/16″
21′-4½″	17	3	6	5	6	....	4″	3″	7/16″
22′-5″	18	3	6	6	6	....	3″	2½″	7/16″
22′-6″	18	3	6	6	6	....	3½″	3″	7/16″
22′-7″	18	3	6	6	6	....	4″	3″	7/16″
22′-8½″	18	4	4	5	5	4	3″	2½″	½″
22′-10″	18	4	4	5	5	4	3½″	3″	½″
22′-11½″	18	4	4	5	5	4	4″	3″	½″
25′-1½″	20	4	5	5	5	5	3″	2½″	½″
25′-3″	20	4	5	5	5	5	3½″	3″	½″
25′-4½″	20	4	5	5	5	5	4″	3″	½″
27′-6½″	22	4	5	6	6	5	3″	2½″	½″
27′-8″	22	4	5	6	6	6	3½″	3″	½″
27′-9½″	22	4	5	6	6	6	4″	3″	½″
29′-11½″	24	4	6	6	6	6	3″	2½″	½″
30′-1″	24	4	6	6	6	6	3½″	3″	½″
30′-2½″	24	4	6	6	6	6	4″	3″	½″



IMPORTANT NOTE

Stock sash is made in two glass sizes: 12″ x 18″ and 14″ x 20″. 12-inch widths of glass can be used only with 18″ heights of glass. 14-inch widths of glass can be used only with 20-inch heights of glass. For any one window opening 12″ x 18″ glass sizes cannot be combined with 14″ x 20″.

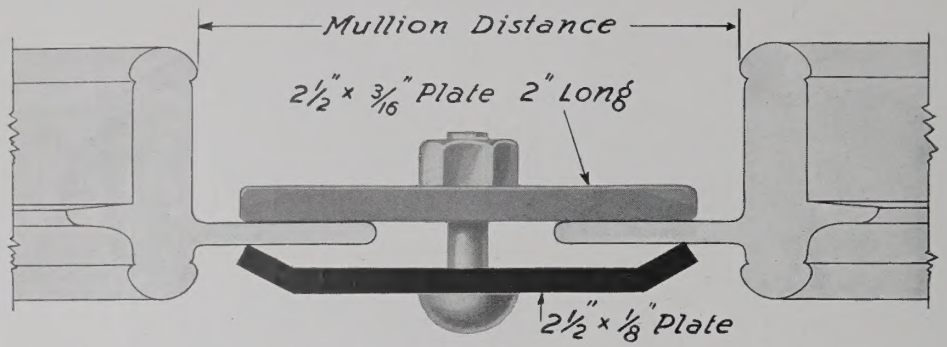
Heights of Window Openings for Stock Sash

TABLE No. 1A—12″ x 18″ GLASS

Height of Window Opening	No. of Lights High	Clearance at Head
3′-2″	2	5/8″
4′-8½″	3	5/8″
6′-3″	4	5/8″
7′-9½″	5	5/8″
9′-4″	6	5/8″

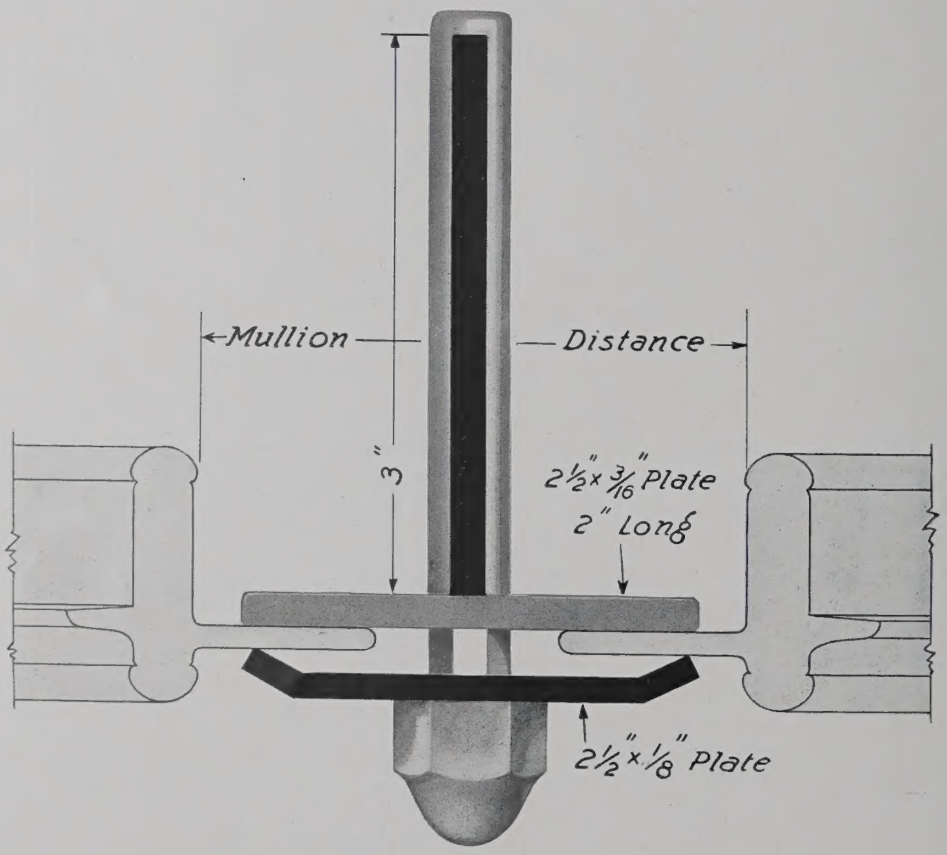
TABLE No. 2A—14″ x 20″ GLASS

Height of Window Opening	No. of Lights High	Clearance at Head
3′-6″	2	5/8″
5′-2½″	3	5/8″
6′-11″	4	5/8″
8′-7½″	5	5/8″
10′-4″	6	5/8″



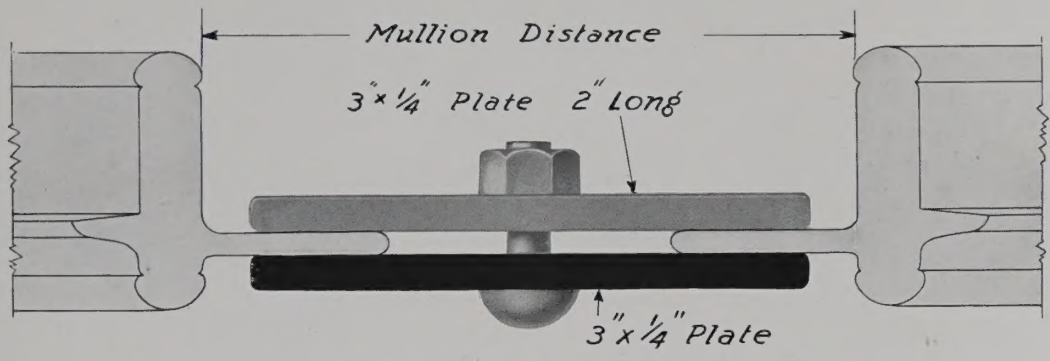
TYPE S-1 MULLION

Used with Stock Sash up to 6'–0" in height and mullion distance of 3".



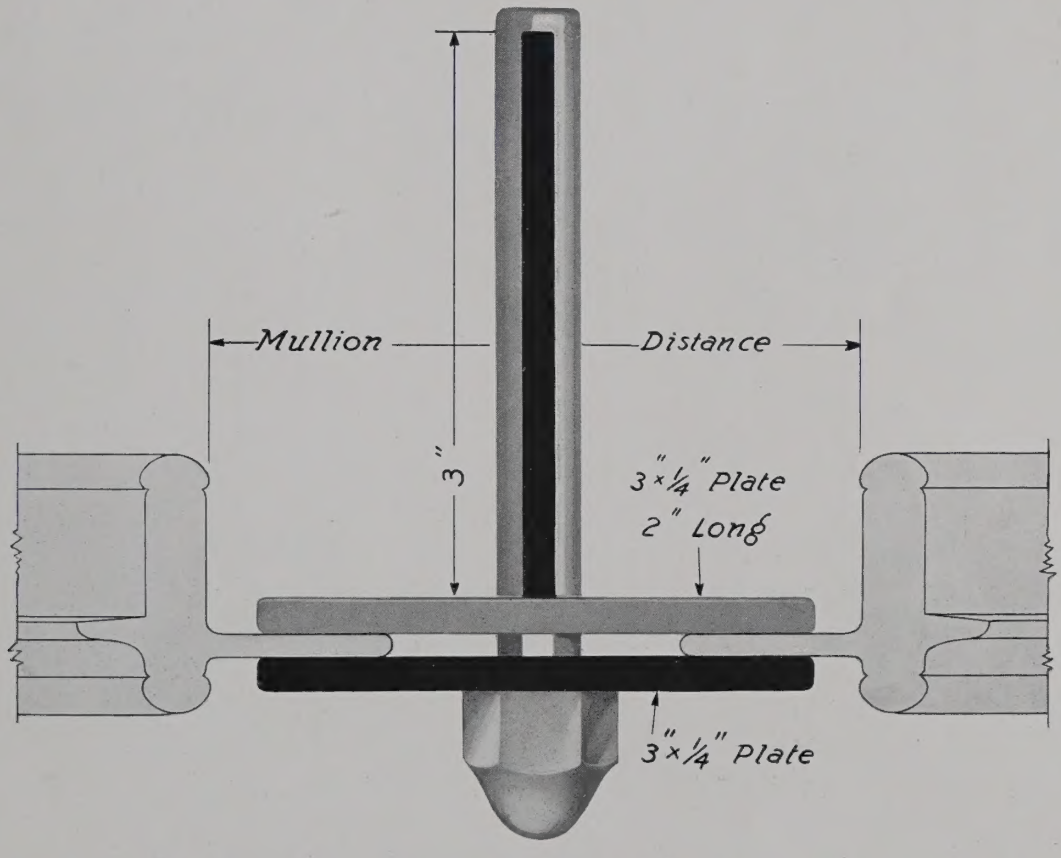
TYPE S-7 MULLION

Used with Stock Sash over 6'–0" in height and mullion distance of 3".



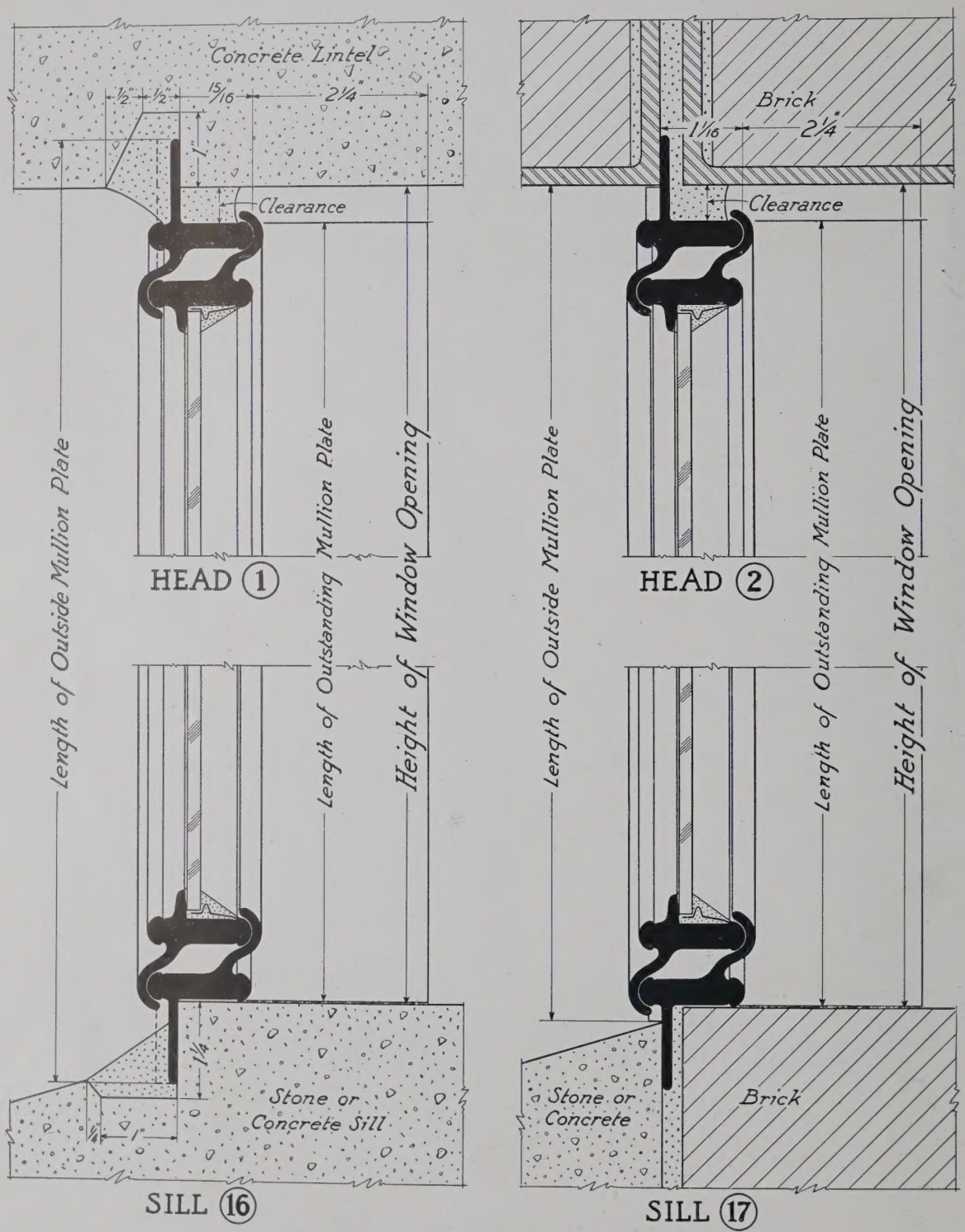
TYPE S-2 MULLION

Used with Stock Sash up to 6'–0" in height and mullion distance of 3½" and 4".



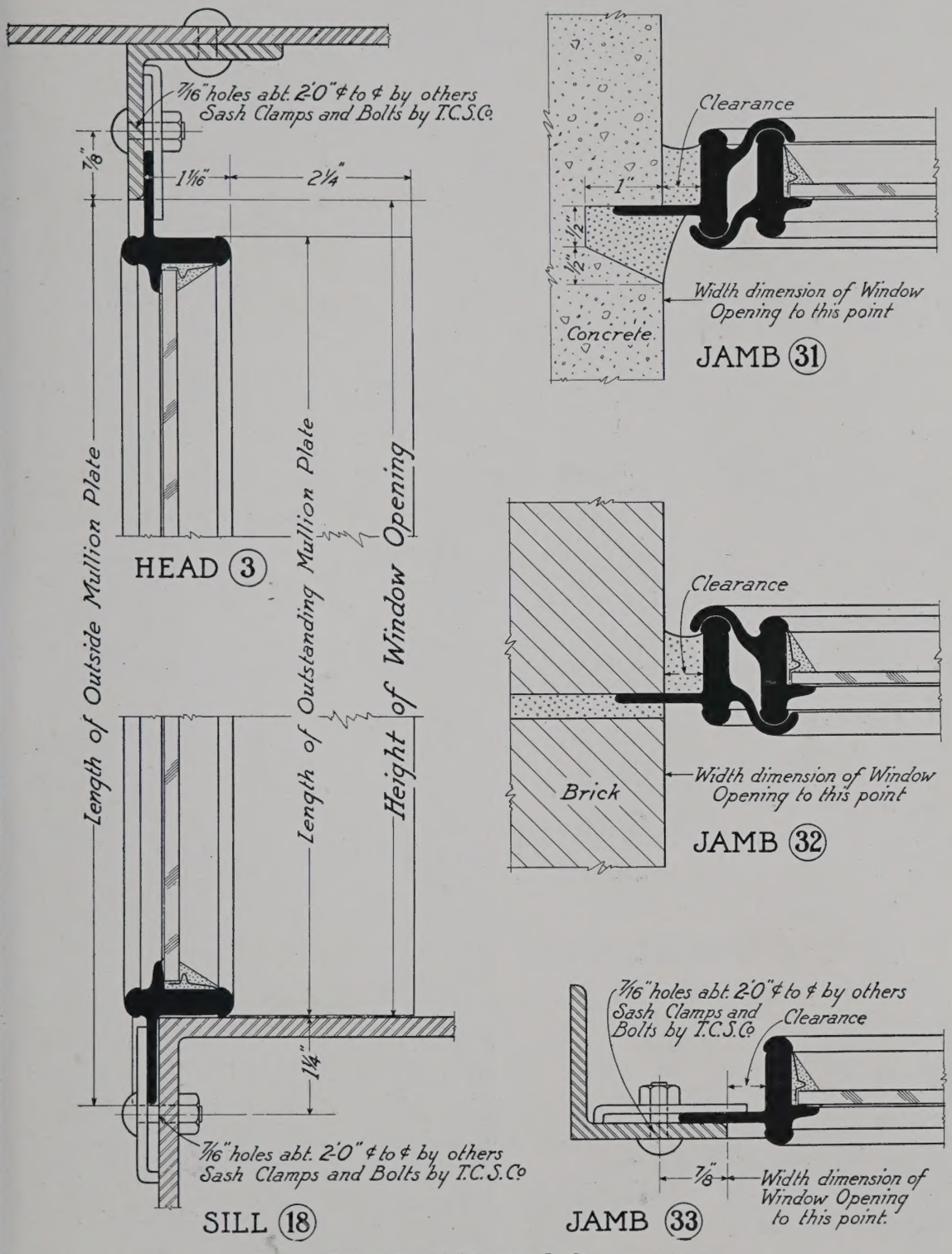
TYPE S-8 MULLION

Used with Stock Sash over 6'–0" in height and mullion distance of 3½" and 4".



Details of Typical Connections

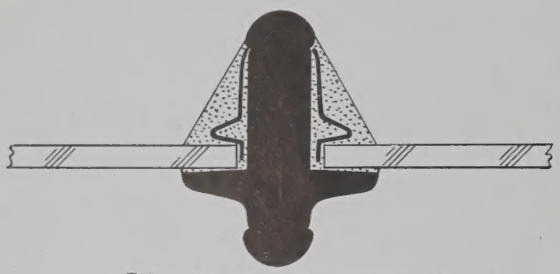
One-half Size



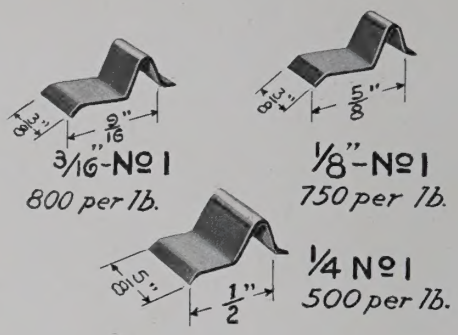
Details of Typical Connections

One-half Size

Glazing Stock Sash



SINGLE GLAZING
(With Glazing Clips)



Stock sash are glazed from the inside only.

The special spring clips for glazing are readily set in place by means of an ordinary putty knife as illustrated. These clips firmly press the glass against the putty and at the same time have enough elasticity to take up the variations in the glass and to absorb the shock of vibration. If desired, special glazing pliers for installing clips can be supplied.

The continuous ledge, extending the entire length of the steel section, prevents the putty from working loose or cracking away. The sash sections are so designed that a saving of over 50% is made in the amount of putty required. This fact, together with the use of Spring Clips, makes the cost of glazing United Steel Sash very low.

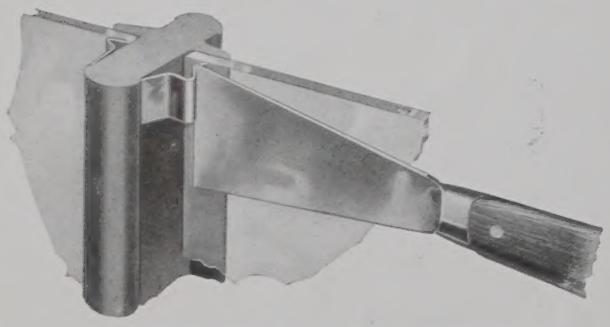
The glass bears evenly on its four edges against a continuous one-piece steel section extending completely around the light. There can be no movement at the joint to cause breakage of glass and loosening of putty. Spring Clips of proper size for any thickness glass are furnished free with each order of United Steel Sash.

The top and bottom rows of glass in the ventilators are 7/8" shorter and the glass along the sides of the ventilators is 7/8" narrower than the glass in the remainder of the sash. This should be noted in ordering glass.

United Steel Sash Putty

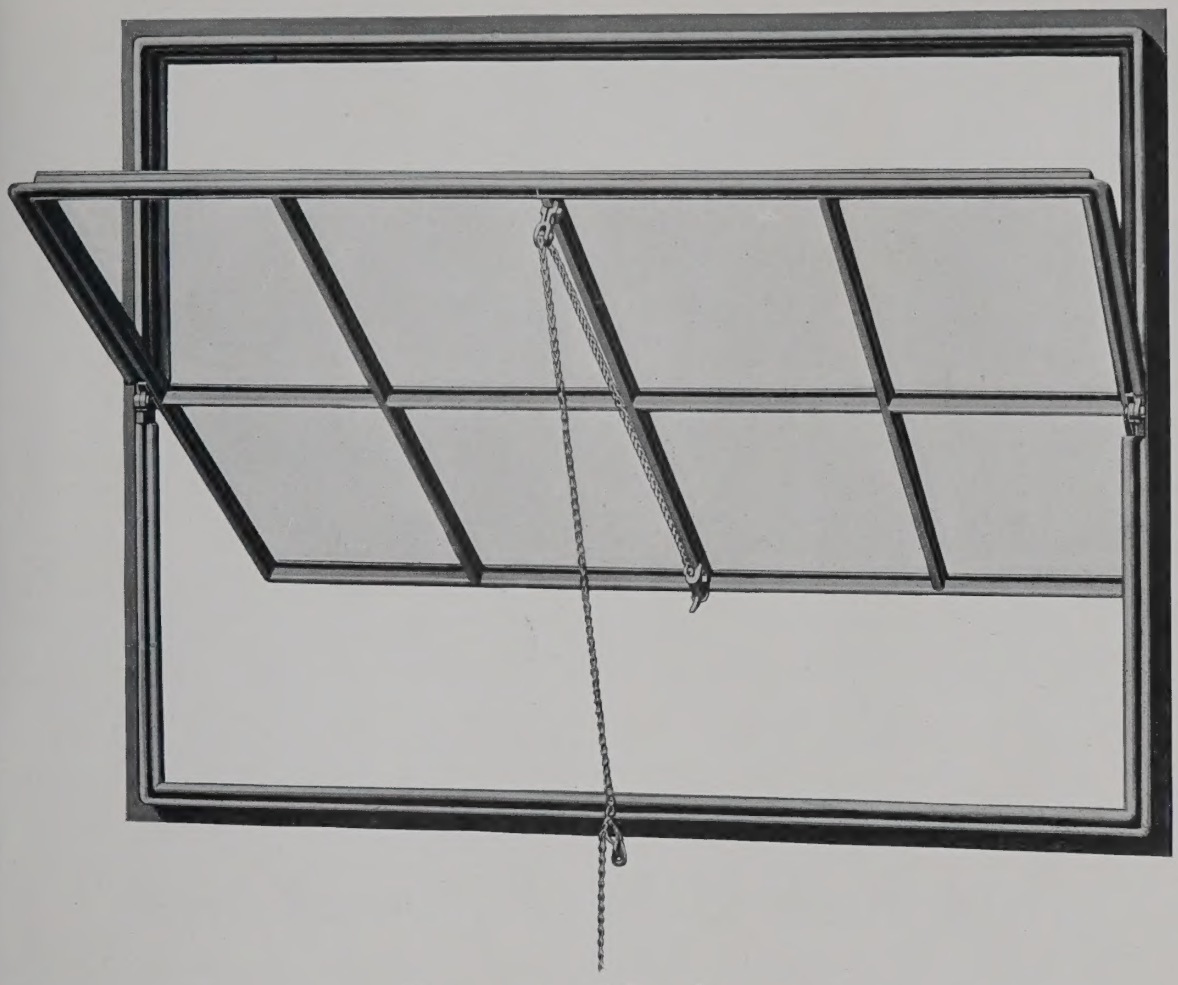
United Steel Sash Putty represents the result of extensive practical tests to determine the best product for metal sash. It glazes easily and smoothly, shows a perfect adhesion for both metal and glass, hardens throughout evenly and uniformly in a comparatively short time to a tough and resistive body, costs no more than any good putty and gives results that are far more efficient and satisfactory.

Spring Clip in Place



Installing Spring Clip with Putty Knife

By Pushing on the Putty Knife, the edge of the Spring Clip moves towards the sash until it springs in place



Type A2 Hardware

This hardware is furnished with all stock sash ventilators. It can be operated with either sash cord or chain. Cord or chain is not furnished unless specifically noted in contract.

Instructions for Ordering Stock Sash

1st. Name.
Give name of consignee, owner and name or title of building.

2nd. Shipping Directions.
Show clearly the railroad to be shipped over, point of delivery, the date on which shipment is required and complete billing instructions.

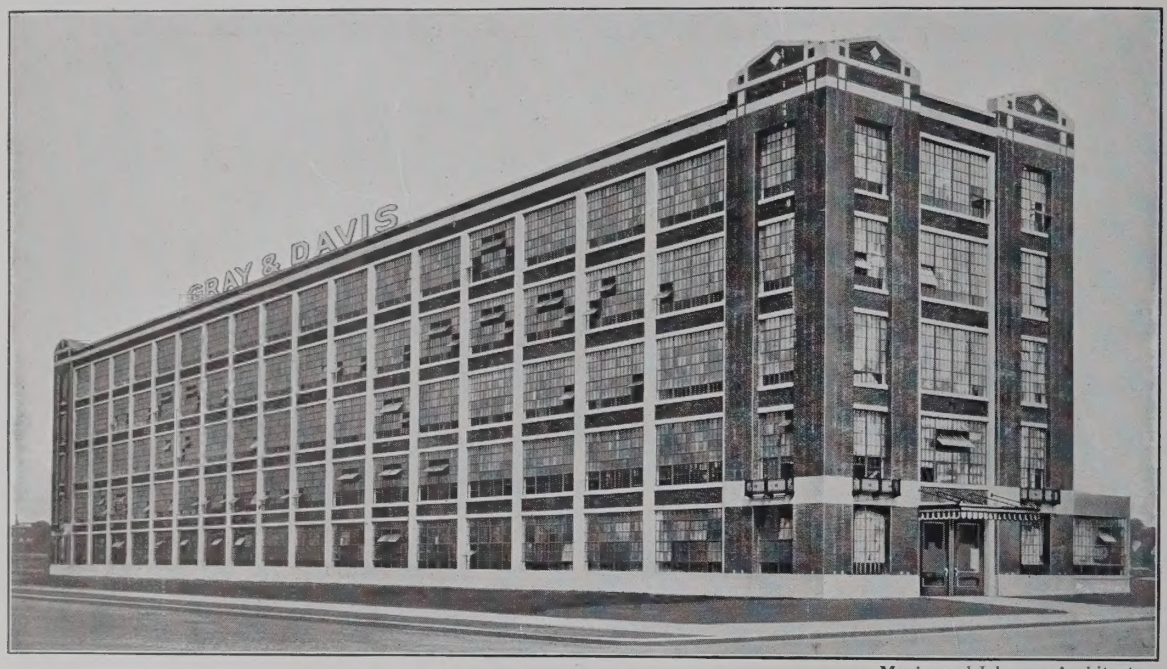
3rd. Type of Sash.
Give the stock numbers of the sash required.

4th. Mullions.
Give the number, type and length of mullions required, or state clearly which sash are to be combined with mullions.

5th. Details.
Give detail numbers of sills, lintels and jambs. (See pages 22 and 23.)

6th. Glass.
Give thickness of glass so that proper glazing clips may be furnished.

7th. Miscellaneous.
Give number of sash clamps and bolts if required.



Monks and Johnson, Architects

Gray & Davis, Inc., Cambridge, Mass.

The wide expanse of windows equipped with United Steel Sash flood the interior with Daylight
Note the attractive appearance of these sash.

Semi-Stock Units of Pivoted Sash

In semi-stock sash the ventilators are carried in stock in a large variety of types and sizes. The frames around the ventilators are made to order to meet the particular requirements for each building operation.

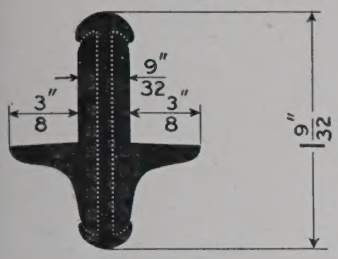
Semi-stock sash are thus furnished in practically an unlimited number of sizes and arrangements of ventilators, so as to meet all conditions of building construction. In addition, each type is furnished in nine glass sizes—12″ x 18″, 12″ x 20″, 12″ x 22″, 14″ x 18″, 14″ x 20″, 14″ x 22″, 16″ x 18″, 16″ x 20″ and 16″ x 22″.

Any size of window opening and any amount and arrangement of ventilation can be obtained by the use of semi-stock units of United Steel Sash. Semi-stock units assure practically all the advantages of to-order sash, but at the same time standardize manufacturing so as to secure greater promptness in shipment and economy in production. The same high quality in design, material and workmanship as described on Pages 3 to 15 obtains throughout in the manufacture of semi-stock units.

We also refer the reader to our two other types of pivoted sash, stock sash (see Pages 16 to 25) and to-order sash (see Pages 52 to 86).

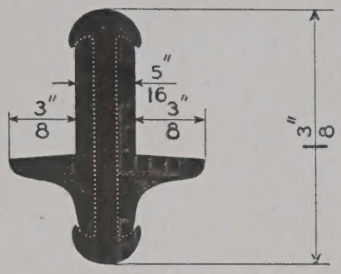
On the following pages we illustrate the types of semi-stock sash most generally used. The designer should understand, however, that the ventilators in these sash can be located in practically any position throughout the height of the sash, so long as the same ventilator is adhered to. This would make possible a multitude of other units of semi-stock sash. It would be manifestly impossible to show all units in a catalog of limited size.

We refer the reader to the notes accompanying the diagrams of semi-stock units and also tables of dimensions of combinations of units, on Pages 28 to 40.



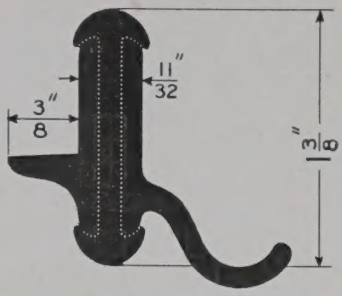
Nº 101 SECTION

Interior Horizontal Muntin



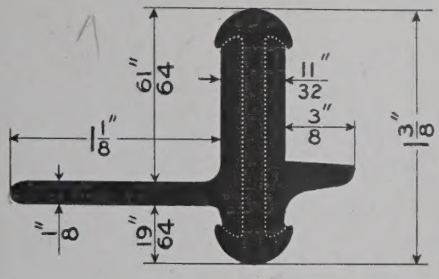
Nº 121 SECTION

Interior Vertical Muntin



Nº 125 SECTION

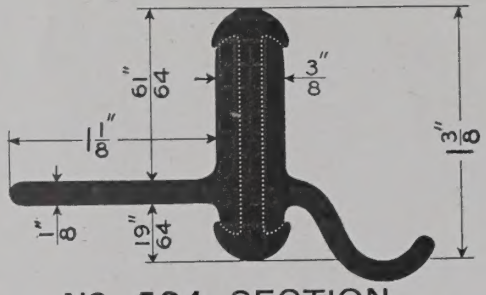
Ventilator Section



Nº 124 SECTION

(Nº 4 Regular)

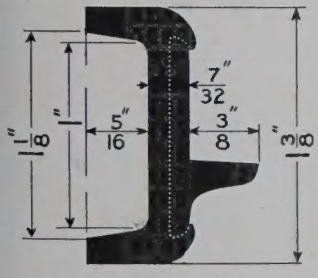
Outside Angle Section



Nº 524 SECTION

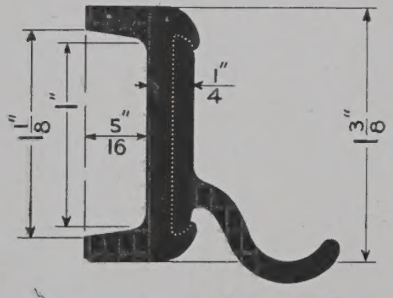
(Nº 4 Regular)

Outside Angle Section at Ventilator



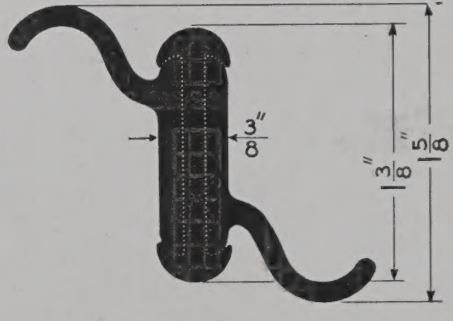
Nº 13 SECTION

Outside Channel Section. Used only at Jambs with Type A Mullions



Nº 53 SECTION

Outside Channel Section at Ventilator Used only at Jambs with Type A Mullions



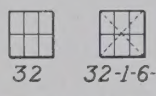
Nº 525 SECTION

Horizontal Muntin Between Two Ventilators

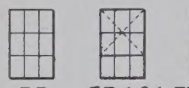
Sections of Semi-Stock Sash

Semi-Stock Sash Units

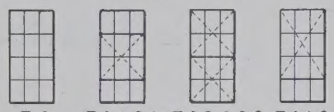
Three Lights Wide



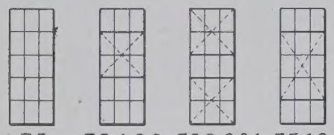
32 32-1-6-0



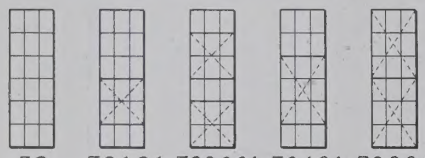
33 33-1-6-1 33-1-9-0



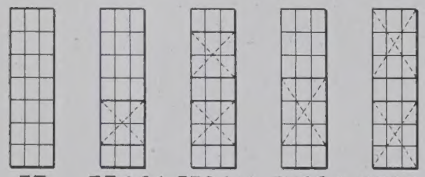
34 34-1-6-1 34-2-6-0-0 34-1-9-1



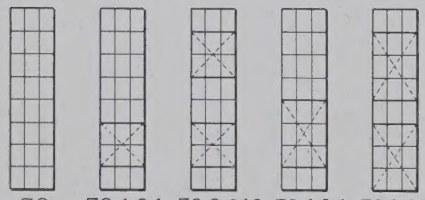
35 35-1-6-2 35-2-6-0-1 35-1-9-1



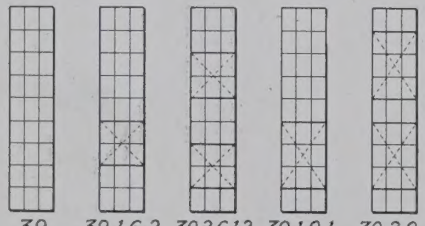
36 36-1-6-1 36-2-6-0-1 36-1-9-1 36-2-9-0-0



37 37-1-6-1 37-2-6-1-1 37-1-9-1 37-2-9-0-1



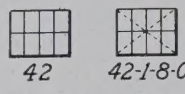
38 38-1-6-1 38-2-6-1-2 38-1-9-1 38-2-9-0-1



39 39-1-6-2 39-2-6-1-2 39-1-9-1 39-2-9-1-1

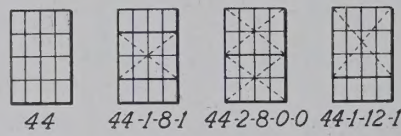
Glass Sizes:
12″ x 18″
12″ x 20″
12″ x 22″
14″ x 18″
14″ x 20″
14″ x 22″
16″ x 18″
16″ x 20″
16″ x 22″
See note below

Four Lights Wide

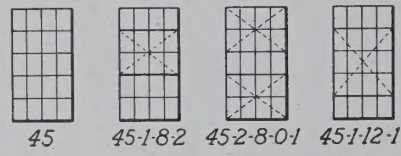


42 42-1-8-0

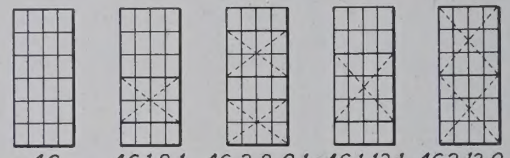
43 43-1-8-1 43-1-12-0



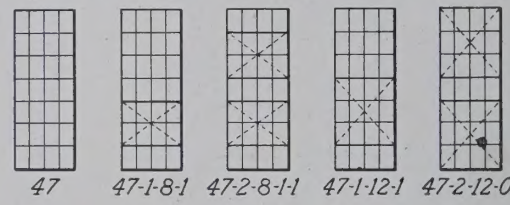
44 44-1-8-1 44-2-8-0-0 44-1-12-1



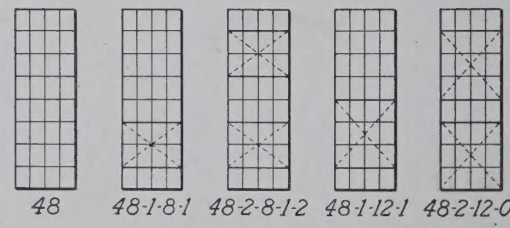
45 45-1-8-2 45-2-8-0-1 45-1-12-1



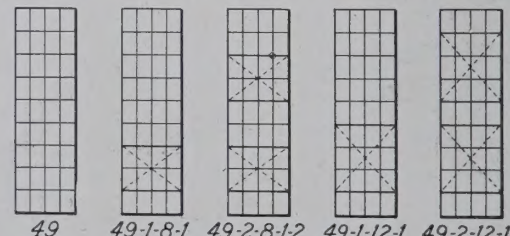
46 46-1-8-1 46-2-8-0-1 46-1-12-1 46-2-12-0-0



47 47-1-8-1 47-2-8-1-1 47-1-12-1 47-2-12-0-1



48 48-1-8-1 48-2-8-1-2 48-1-12-1 48-2-12-0-1



49 49-1-8-1 49-2-8-1-2 49-1-12-1 49-2-12-1-1

Glass Sizes:
12″ x 18″
12″ x 20″
12″ x 22″
14″ x 18″
14″ x 20″
14″ x 22″
16″ x 18″
16″ x 20″
16″ x 22″
See note below

Note—Sash 8 lights high are not furnished with glass sizes 12″ x 22″, 14″ x 22″, 16″ x 22″.
Sash 9 lights high are only furnished with glass sizes 12″ x 18″, 14″ x 18″, 16″ x 18″.
Ventilators 3 lights high are only furnished with 18″ glass in height.
Ventilators 5 lights wide are only furnished with 12″ glass in width.
Ventilators may be located in other positions in the sash than shown above.

Semi-Stock Sash Units

Five Lights Wide

52

52-1-6-0

52-1-10-0

53

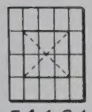
53-1-6-1

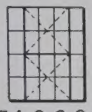
53-1-10-1

53-1-9-0

53-1-15-0

54


54-1-6-1


54-2-6-0-0

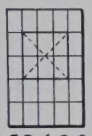
54-1-9-1

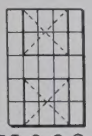
54-1-10-1

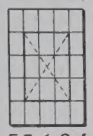
54-2-10-0-0

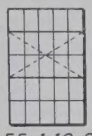
54-1-15-1

55


55-1-6-2


55-2-6-0-1

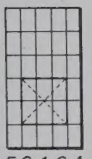

55-1-9-1

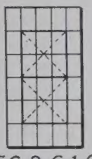

55-1-10-2

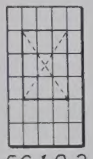
55-2-10-0-1

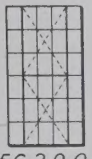
55-1-15-1

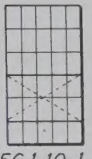
56

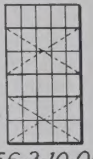

56-1-6-1

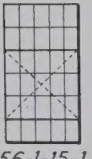

56-2-6-1-0

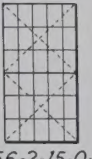

56-1-9-2


56-2-9-0-0

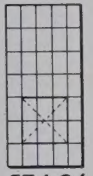

56-1-10-1


56-2-10-0-1

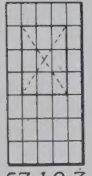

56-1-15-1

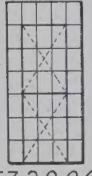

56-2-15-0-0

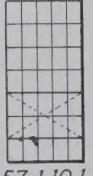
57

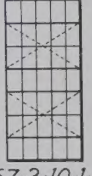

57-1-6-1

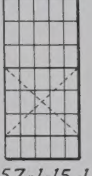
57-2-6-1-1


57-1-9-3


57-2-9-0-0


57-1-10-1


57-2-10-1-1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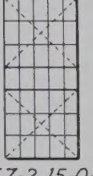
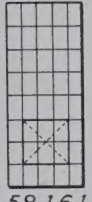
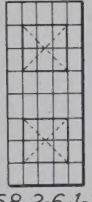
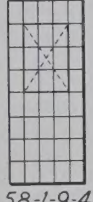
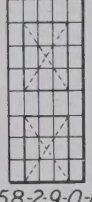

57-2-15-0-1

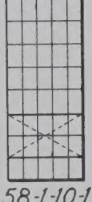
58

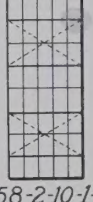

58-1-6-1

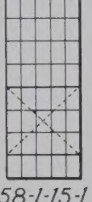

58-2-6-1-2

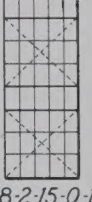

58-1-9-4


58-2-9-0-1

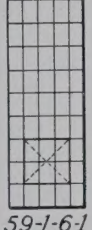

58-1-10-1

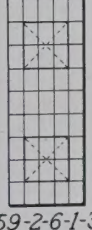

58-2-10-1-2

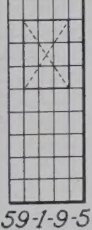

58-1-15-1

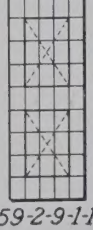

58-2-15-0-1

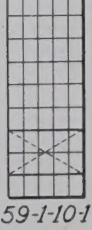
59

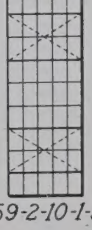

59-1-6-1

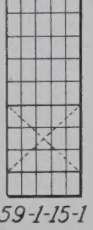

59-2-6-1-3

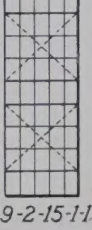

59-1-9-5


59-2-9-1-1


59-1-10-1


59-2-10-1-3


59-1-15-1


59-2-15-1-1

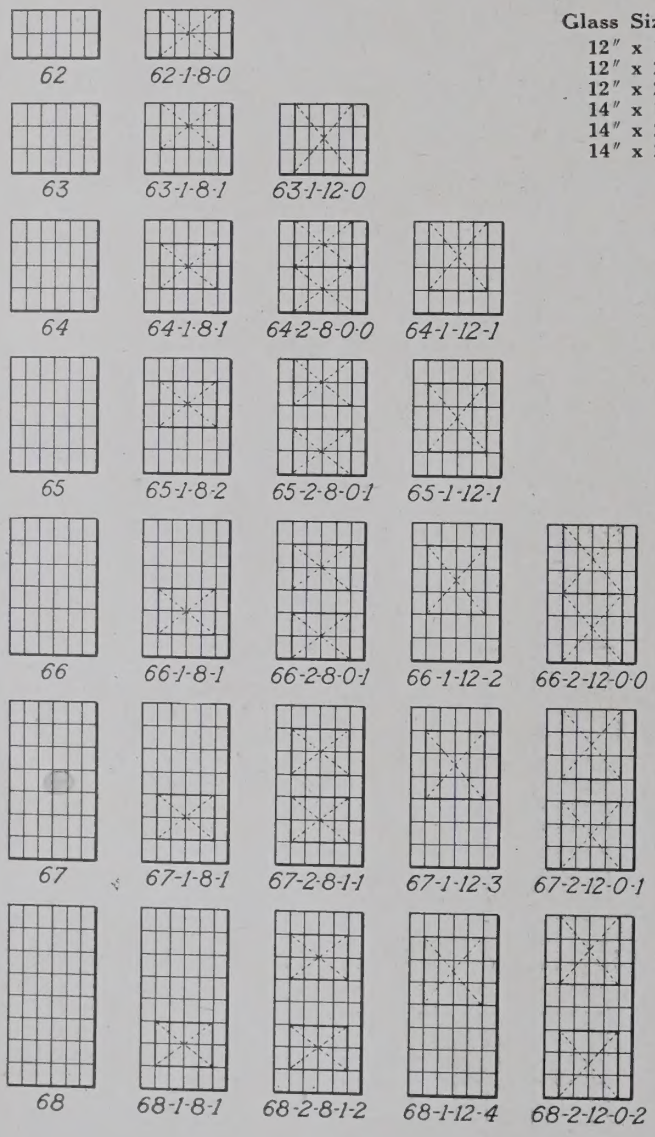
Glass Sizes:
12″ x 18″
12″ x 20″
12″ x 22″
14″ x 18″
14″ x 20″
14″ x 22″
16″ x 18″
16″ x 20″
16″ x 22″
See note below

Note—Sash 7 lights high are not furnished with glass sizes 16″ x 22″.
Sash 8 lights high are only furnished with glass sizes 12″ x 18″, 12″ x 20″, 14″ x 18″, 16″ x 18″.
Sash 9 lights high are only furnished with glass sizes 12″ x 18″.
Ventilators 3 lights high are only furnished with 18″ glass in height.
Ventilators 5 lights wide are only furnished with 12″ glass in width.

Ventilators shown above may be located in any position in the sash, but must be symmetrical about its vertical center line.

Semi-Stock Sash Units

Six Lights Wide



Glass Sizes:
12″ x 18″
12″ x 20″
12″ x 22″
14″ x 18″
14″ x 20″
14″ x 22″

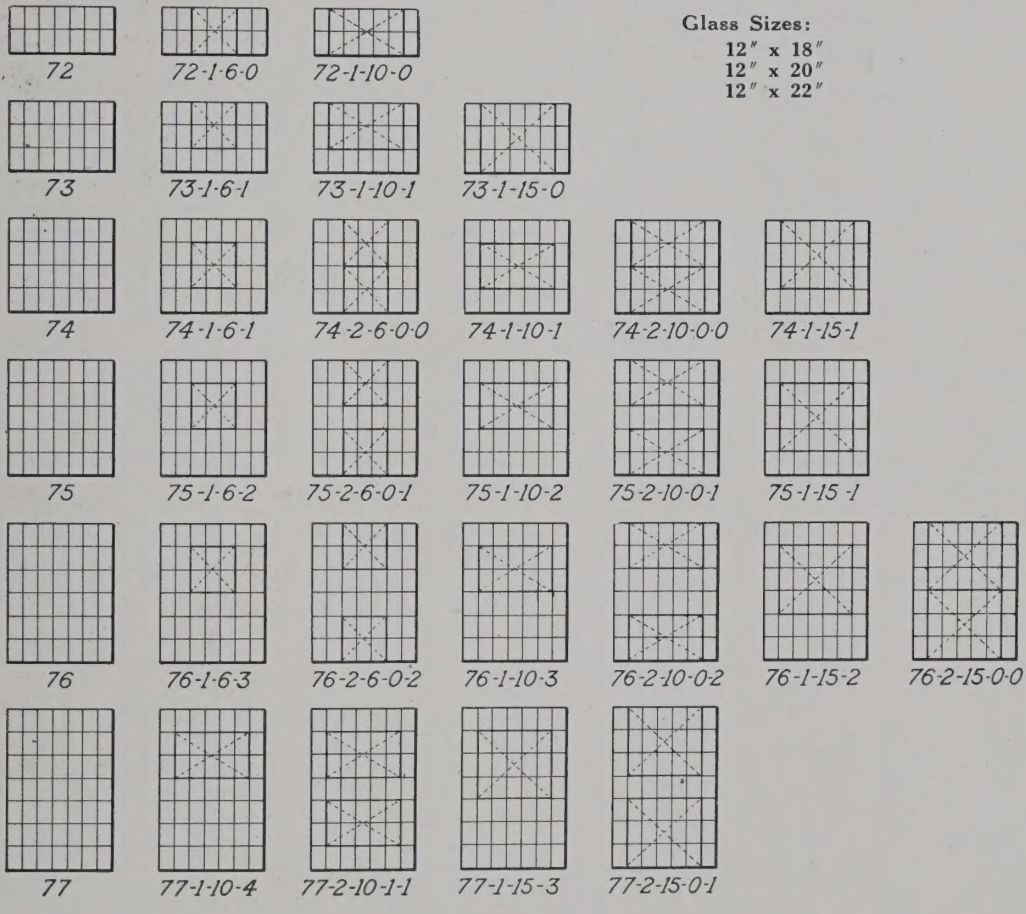
Note—Sash 7 lights high are only furnished with glass sizes 12″ x 18″, 12″ x 20″, 14″ x 18″.
Sash 8 lights high are only furnished with glass sizes 12″ x 18″.
Ventilators 3 lights high are only furnished with 18″ glass in height.
Ventilators 5 lights wide are only furnished with 12″ glass in width.

Ventilators shown above may be located in any position in the sash, but must be symmetrical about its vertical center line.

Semi-Stock Sash Units

Seven Lights Wide

Glass Sizes:
12″ x 18″
12″ x 20″
12″ x 22″



Note—Sash 7 lights high are only furnished with 12″ x 18″ glass size.

Ventilators 3 lights high are only furnished with 18″ glass in height.

Ventilators 5 lights wide are only furnished with 12″ glass in width.

Ventilators shown above may be located in any position in the sash, but must be symmetrical about its vertical center line.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

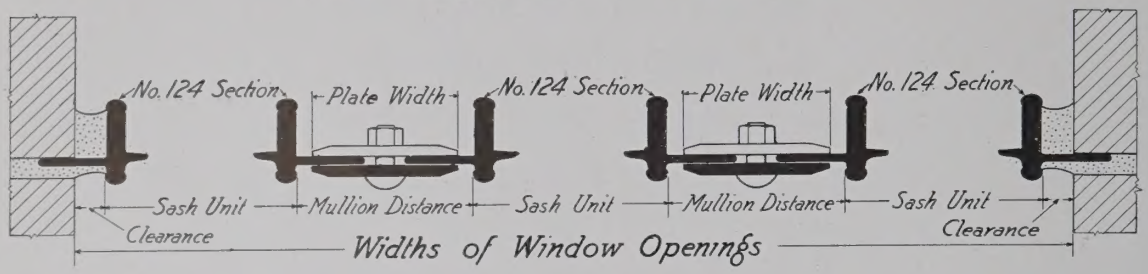


TABLE NO. 3

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Width of Mullion Plates	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
3 '-3"	3	1	3	12"									9/16"
3 '-9"	3	1	3	14"									9/16"
4 '-3"	3	1	3	16"									9/16"
4 '-3½"	4	1	4	12"									9/16"
4 '-11½"	4	1	4	14"									9/16"
5 '-4"	5	1	5	12"									9/16"
5 '-7½"	4	1	4	16"									9/16"
6 '-2"	5	1	5	14"									9/16"
6 '-4½"	6	1	6	12"									9/16"
6 '-8"	6	2	3	12"	3	12"					3"	2½"	5/8"
6 '-9"	6	2	3	12"	3	12"					4"	3"	5/8"
7 '-0"	5	1	5	16"									9/16"
7 '-4½"	6	1	6	14"									9/16"
7 '-5"	7	1	7	12"									9/16"
7 '-8"	6	2	3	14"	3	14"					3"	2½"	5/8"
7 '-9"	6	2	3	14"	3	14"					4"	3"	5/8"
8 '-8"	6	2	3	16"	3	16"					3"	2½"	5/8"
8 '-9"	6	2	3	16"	3	16"					4"	3"	5/8"
8 '10"	8	2	4	12"	4	12"					3"	2½"	5/8"
10 '-0½"	9	3	3	12"	3	12"	3	12"			3"	2½"	7/16"
10 '-1"	8	2	4	14"	4	14"					3"	2½"	5/8"
10 '-1½"	9	3	3	12"	3	12"	3	12"			3½"	3"	7/16"
10 '-2"	8	2	4	14"	4	14"					4"	3"	5/8"
10 '-2½"	9	3	3	12"	3	12"	3	12"			4"	3"	7/16"
10 '-6½"	9	3	3	12"	3	14"	3	12"			3"	2½"	7/16"
10 '-7½"	9	3	3	12"	3	14"	3	12"			3½"	3"	7/16"
10 '-8½"	9	3	3	12"	3	14"	3	12"			4"	3"	7/16"
10 '-10"	10	2	5	12"	5	12"					3"	2½"	5/8"
10 '-11"	10	2	5	12"	5	12"					4"	3"	5/8"
11 '-0½"	9	3	3	14"	3	12"	3	14"			3"	2½"	7/16"
11 '-1"	10	3	3	12"	4	12"	3	12"			3"	2½"	7/16"
11 '-1½"	9	3	3	14"	3	12"	3	14"			3½"	3"	7/16"
11 '-2"	10	3	3	12"	4	12"	3	12"			3½"	3"	7/16"
11 '-2½"	9	3	3	14"	3	12"	3	14"			4"	3"	7/16"
11 '-3"	10	3	3	12"	4	12"	3	12"			4"	3"	7/16"
11 '-5"	8	2	4	16"	4	16"					3"	2½"	5/8"
11 '-6"	8	2	4	16"	4	16"					4"	3"	5/8"
11 '-6½"	9	3	3	14"	3	14"	3	14"			3"	2½"	7/16"
11 '-7½"	9	3	3	14"	3	14"	3	14"			3½"	3"	7/16"
11 '-8½"	9	3	3	14"	3	14"	3	14"			4"	3"	7/16"
11 '-9"	10	3	3	12"	4	14"	3	12"			3"	2½"	7/16"
11 '-10"	10	3	3	12"	4	14"	3	12"			3½"	3"	7/16"
11 '-11"	10	3	3	12"	4	14"	3	12"			4"	3"	7/16"
12 '-1"	10	3	3	14"	4	12"	3	14"			3"	2½"	7/16"

Continued on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

TABLE NO. 3—Continued

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Width of Mullion Plates	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
12 '-1½"	11	3	3	12"	5	12"	3	12"	.....	.....	3"	2½"	7/16"
12 '-2"	10	3	3	14"	4	12"	3	14"	.....	.....	3½"	3"	7/16"
12 '-2½"	11	3	3	12"	5	12"	3	12"	.....	.....	3½"	3"	7/16"
12 '-3"	10	3	3	14"	4	12"	3	14"	.....	.....	4"	3"	7/16"
12 '-3½"	11	3	3	12"	5	12"	3	12"	.....	.....	4"	3"	7/16"
12 '-6"	10	2	5	14"	5	14"	.....	.....	.....	.....	3"	2½"	5/8"
12 '-6½"	9	3	3	16"	3	14"	3	16"	.....	.....	3"	2½"	7/16"
12 '-7"	10	2	5	14"	5	14"	.....	.....	.....	.....	4"	3"	5/8"
12"-7½"	9	3	3	16"	3	14"	3	16"	.....	.....	3½"	3"	7/16"
12 '-7½"	11	3	4	12"	3	14"	4	12"	.....	.....	3"	2½"	7/16"
12 '-8½"	9	3	3	16"	3	14"	3	16"	.....	.....	4"	3"	7/16"
12 '-8½"	11	3	4	12"	3	14"	4	12"	.....	.....	3½"	3"	7/16"
12 '-9"	10	3	3	14"	4	14"	3	14"	.....	.....	3"	2½"	7/16"
12 '-9½"	11	3	4	12"	3	14"	4	12"	.....	.....	4"	3"	7/16"
12 '-10"	10	3	3	14"	4	14"	3	14"	.....	.....	3½"	3"	7/16"
12 '-11"	10	3	3	14"	4	14"	3	14"	.....	.....	4"	3"	7/16"
12 '-11"	12	2	6	12"	6	12"	.....	.....	.....	.....	3"	2½"	5/8"
12 '-11½"	11	3	3	12"	5	14"	3	12"	.....	.....	3"	2½"	7/16"
13 '-0"	12	2	6	12"	6	12"	.....	.....	.....	.....	4"	3"	5/8"
13 '-0½"	11	3	3	12"	5	14"	3	12"	.....	.....	3½"	3"	7/16"
13 '-0½"	9	3	3	16"	3	16"	3	16"	.....	.....	3"	2½"	7/16"
13 '-1½"	11	3	3	12"	5	14"	3	12"	.....	.....	4"	3"	7/16"
13"-1½"	9	3	3	16"	3	16"	3	16"	.....	.....	3½"	3"	7/16"
13 '-1½"	11	3	3	14"	5	12"	3	14"	.....	.....	3"	2½"	7/16"
13 '-2"	12	3	4	12"	4	12"	4	12"	.....	.....	3"	2½"	7/16"
13 '-2½"	9	3	3	16"	3	16"	3	16"	.....	.....	4"	3"	7/16"
13 '-2½"	11	3	3	14"	5	12"	3	14"	.....	.....	3½"	3"	½"
13 '-3"	12	3	4	12"	4	12"	4	12"	.....	.....	3½"	3"	7/16"
13 '-3½"	11	3	3	14"	5	12"	3	14"	.....	.....	4"	3"	7/16"
13 '-4"	12	3	4	12"	4	12"	4	12"	.....	.....	4"	3"	7/16"
13 '-5"	10	3	3	14"	4	16"	3	14"	.....	.....	3"	2½"	7/16"
13 '-5½"	11	3	4	14"	3	12"	4	14"	.....	.....	3"	2½"	7/16"
13 '-6"	10	3	3	14"	4	16"	3	14"	.....	.....	3½"	3"	7/16"
13 '-6½"	11	3	4	14"	3	12"	4	14"	.....	.....	3½"	3"	7/16"
13 '-7"	10	3	3	14"	4	16"	3	14"	.....	.....	4"	3"	7/16"
13 '-7½"	11	3	4	14"	3	12"	4	14"	.....	.....	4"	3"	7/16"
13 '-9"	10	3	3	16"	4	14"	3	16"	.....	.....	3"	2½"	7/16"
13 '-10"	10	3	3	16"	4	14"	3	16"	.....	.....	3½"	3"	7/16"
13 '-11"	10	3	3	16"	4	14"	3	16"	.....	.....	4"	3"	7/16"
13 '-11½"	11	3	3	14"	5	14"	3	14"	.....	.....	3"	2½"	7/16"
14 '-0½"	11	3	3	14"	5	14"	3	14"	.....	.....	3½"	3"	7/16"
14 '-1½"	11	3	3	14"	5	14"	3	14"	.....	.....	4"	3"	7/16"
14 '-2"	10	2	5	16"	5	16"	.....	.....	.....	.....	3"	2½"	5/8"
14 '-2"	12	3	3	14"	6	12"	3	14"	.....	.....	3"	2½"	7/16"
14 '-2½"	13	3	4	12"	5	12"	4	12"	.....	.....	3"	2½"	7/16"
14 '-3"	10	2	5	16"	5	16"	.....	.....	.....	.....	4"	3"	5/8"
14 '-3"	12	3	3	14"	6	12"	3	14"	.....	.....	3½"	3"	7/16"
14 '-3½"	13	3	4	12"	5	12"	4	12"	.....	.....	3½"	3"	7/16"
14 '-4"	12	3	3	14"	6	12"	3	14"	.....	.....	4"	3"	7/16"
14 '-4½"	13	3	4	12"	5	12"	4	12"	.....	.....	4"	3"	7/16"
14 '-5"	10	3	3	16"	4	16"	3	16"	.....	.....	3"	2½"	7/16"
14 '-5½"	11	3	4	14"	3	16"	4	14"	.....	.....	3"	2½"	7/16"
14 '-6"	10	3	3	16"	4	16"	3	16"	.....	.....	3½"	3"	7/16"
14 '-6"	12	3	4	14"	4	12"	4	14"	.....	.....	3"	2½"	7/16"
14 '-6½"	11	3	4	14"	3	16"	4	14"	.....	.....	3½"	3"	7/16"
14 '-7"	10	3	3	16"	4	16"	3	16"	.....	.....	4"	3"	7/16"
14 '-7"	12	3	4	14"	4	12"	4	14"	.....	.....	3½"	3"	7/16"
14 '-7½"	11	3	4	14"	3	16"	4	14"	.....	.....	4"	3"	7/16"
14 '-8"	12	3	4	14"	4	12"	4	14"	.....	.....	4"	3"	7/16"
14 '-8½"	13	3	5	12"	3	14"	5	12"	.....	.....	3"	2½"	7/16"
14 '-9½"	11	3	3	14"	5	16"	3	14"	.....	.....	3"	2½"	7/16"
14 '-9½"	13	3	5	12"	3	14"	5	12"	.....	.....	3½"	3"	7/16"
14 '-10½"	11	3	3	14"	5	16"	3	14"	.....	.....	3½"	3"	7/16"
14 '-10½"	13	3	5	12"	3	14"	5	12"	.....	.....	4"	3"	7/16"

Continued on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

TABLE NO. 3—Continued

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Width of Mullion Plates	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
14'-11"	12	2	6	14"	6	14"					3"	2½"	5/8"
14'-11½"	11	3	3	14"	5	16"	3	14"			4"	3"	7/16"
14'-11½"	11	3	3	16"	5	14"	3	16"			3"	2½"	7/16"
15'-0"	12	2	6	14"	6	14"					4"	3"	5/8"
15'-0"	14	2	7	12"	7	12"					3"	2½"	5/8"
15'-0½"	13	3	4	12"	5	14"	4	12"			3"	2½"	7/16"
15'-0½"	11	3	3	16"	5	14"	3	16"			3½"	3"	7/16"
15'-1"	14	2	7	12"	7	12"					4"	3"	5/8"
15'-1½"	13	3	4	12"	5	14"	4	12"			3½"	3"	7/16"
15'-1½"	11	3	3	16"	5	14"	3	16"			4"	3"	7/16"
15'-2"	12	3	4	14"	4	14"	4	14"			3"	2½"	7/16"
15'-2½"	13	3	4	12"	5	14"	4	12"			4"	3"	7/16"
15'-3"	14	3	4	12"	6	12"	4	12"			3"	2½"	7/16"
15'-3"	12	3	4	14"	4	14"	4	14"			3½"	3"	7/16"
15'-3½"	11	3	4	16"	3	14"	4	16"			3"	2½"	7/16"
15'-4"	14	3	4	12"	6	12"	4	12"			3½"	3"	7/16"
15'-4"	12	3	4	14"	4	14"	4	14"			4"	3"	7/16"
15'-4½"	11	3	4	16"	3	14"	4	16"			3½"	3"	7/16"
15'-5"	14	3	4	12"	6	12"	4	12"			4"	3"	7/16"
15'-5½"	11	3	4	16"	3	14"	4	16"			4"	3"	7/16"
15'-6½"	13	3	4	14"	5	12"	4	14"			3"	2½"	7/16"
15'-7½"	13	3	4	14"	5	12"	4	14"			3½"	3"	7/16"
15'-8½"	13	3	4	14"	5	12"	4	14"			4"	3"	7/16"
15'-9½"	11	3	3	16"	5	16"	3	16"			3"	2½"	7/16"
15'-10"	12	3	4	14"	4	16"	4	14"			3"	2½"	7/16"
15'-10½"	11	3	3	16"	5	16"	3	16"			3½"	3"	7/16"
15'-11"	12	3	4	14"	4	16"	4	14"			3½"	3"	7/16"
15'-11"	14	3	5	12"	4	14"	5	12"			3"	2½"	7/16"
15'-11½"	11	3	3	16"	5	16"	3	16"			4"	3"	7/16"
16'-0"	12	3	4	14"	4	16"	4	14"			4"	3"	7/16"
16'-0"	14	3	5	12"	4	14"	5	12"			3½"	3"	7/16"
16'-1"	14	3	5	12"	4	14"	5	12"			4"	3"	7/16"
16'-2"	12	3	3	16"	6	14"	3	16"			3"	2½"	7/16"
16'-3"	12	3	3	16"	6	14"	3	16"			3½"	3"	7/16"
16'-3"	14	3	4	12"	6	14"	4	12"			3"	2½"	7/16"
16'-3½"	15	3	5	12"	5	12"	5	12"			3"	2½"	7/16"
16'-4"	12	3	3	16"	6	14"	3	16"			4"	3"	7/16"
16'-4"	14	3	4	12"	6	14"	4	12"			3½"	3"	7/16"
16'-4½"	15	3	5	12"	5	12"	5	12"			3½"	3"	7/16"
16'-4½"	13	3	4	14"	5	14"	4	14"			3"	2½"	7/16"
16'-5"	14	3	4	12"	6	14"	4	12"			4"	3"	7/16"
16'-5½"	15	3	5	12"	5	12"	5	12"			4"	3"	7/16"
16'-5½"	13	3	4	14"	5	14"	4	14"			3½"	3"	7/16"
16'-6½"	13	3	4	14"	5	14"	4	14"			4"	3"	7/16"
16'-6½"	14	4	4	12"	3	14"	3	14"	4	12"	3"	2½"	½"
16'-8"	14	4	4	12"	3	14"	3	14"	4	12"	3½"	3"	½"
16'-9½"	14	4	4	12"	3	14"	3	14"	4	12"	4"	3"	½"
16'-9½"	15	3	6	12"	3	14"	6	12"			3"	2½"	7/16"
16'-10½"	15	3	6	12"	3	14"	6	12"			3½"	3"	7/16"
16'-10½"	13	3	5	14"	3	16"	5	14"			3"	2½"	7/16"
16'-11"	14	3	5	14"	4	12"	5	14"			3"	2½"	7/16"
16'11½"	15	3	6	12"	3	14"	6	12"			4"	3"	7/16"
16'-11½"	13	3	5	14"	3	16"	5	14"			3½"	3"	7/16"
17'-0"	14	3	5	14"	4	12"	5	14"			3½"	3"	7/16"
17'-0½"	13	3	5	14"	3	16"	5	14"			4"	3"	7/16"
17'-1"	14	3	5	14"	4	12"	5	14"			4"	3"	7/16"
17'-1½"	15	3	5	12"	5	14"	5	12"			3"	2½"	7/16"
17'-2"	12	3	4	16"	4	16"	4	16"			3"	2½"	7/16"
17'-2½"	15	3	5	12"	5	14"	5	12"			3½"	3"	7/16"
17'-2½"	13	3	4	14"	5	16"	4	14"			3"	2½"	7/16"
17'-3"	12	3	4	16"	4	16"	4	16"			3½"	3"	7/16"
17'-3½"	15	3	5	12"	5	14"	5	12"			4"	3"	7/16"
17'-3½"	13	3	4	14"	5	16"	4	14"			3½"	3"	7/16"

Continued on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

TABLE NO. 3—Continued

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Width of Mullion Plates	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
17'-4"	12	3	4	16"	4	16"	4	16"	.....	.....	4"	3"	7/16"
17'-4"	16	3	5	12"	6	12"	5	12"	.....	.....	3"	2½"	7/16"
17'-4½"	13	3	4	14"	5	16"	4	14"	.....	.....	4"	3"	7/16"
17'-5"	16	3	5	12"	6	12"	5	12"	.....	.....	3½"	3"	7/16"
17'-5½"	12	4	3	16"	3	16"	3	16"	3	16"	3"	2½"	½"
17'-6"	16	3	5	12"	6	12"	5	12"	.....	.....	4"	3"	7/16"
17'-7"	12	4	3	16"	3	16"	3	16"	3	16"	3½"	3"	½"
17'-7"	14	3	4	14"	6	14"	4	14"	.....	.....	3"	2½"	7/16"
17'-7½"	16	4	4	12"	4	12"	4	12"	4	12"	3"	2½"	½"
17'-8"	14	3	4	14"	6	14"	4	14"	.....	.....	3½"	3"	7/16"
17'-8½"	12	4	3	16"	3	16"	3	16"	3	16"	4"	3"	½"
17'-8½"	16	4	4	12"	4	12"	4	12"	4	12"	3½"	3"	½"
17'-9"	14	3	4	14"	6	14"	4	14"	.....	.....	4"	3"	7/16"
17'-10½"	16	4	4	12"	4	12"	4	12"	4	12"	4"	3"	½"
17'-10½"	14	4	3	14"	4	14"	4	14"	3	14"	3"	2½"	½"
17'-11½"	15	3	5	14"	5	12"	5	14"	.....	.....	3"	2½"	7/16"
18'-0"	14	4	3	14"	4	14"	4	14"	3	14"	3½"	3"	½"
18'-0½"	15	3	5	14"	5	12"	5	14"	.....	.....	3½"	3"	7/16"
18'-0½"	13	3	5	16"	3	14"	5	16"	.....	.....	3"	2½"	7/16"
18'-1½"	14	4	3	14"	4	14"	4	14"	3	14"	4"	3"	½"
18'-1½"	15	3	5	14"	5	12"	5	14"	.....	.....	4"	3"	7/16"
18'-1½"	13	3	5	16"	3	14"	5	16"	.....	.....	3½"	3"	7/16"
18'-2½"	13	3	5	16"	3	14"	5	16"	.....	.....	4"	3"	7/16"
18'-3"	14	3	5	14"	4	16"	5	14"	.....	.....	3"	2½"	7/16"
18'-4"	14	3	5	14"	4	16"	5	14"	.....	.....	3½"	3"	7/16"
18'-4"	16	3	5	12"	6	14"	5	12"	.....	.....	3"	2½"	7/16"
18'-4½"	17	3	6	12"	5	12"	6	12"	.....	.....	3"	2½"	7/16"
18'-5"	14	3	5	14"	4	16"	5	14"	.....	.....	4"	3"	7/16"
18'-5"	16	3	5	12"	6	14"	5	12"	.....	.....	3½"	3"	7/16"
18'-5½"	17	3	6	12"	5	12"	6	12"	.....	.....	3½"	3"	7/16"
18'-6"	16	3	5	12"	5	14"	5	12"	.....	.....	4"	3"	7/16"
18'-6½"	17	3	6	12"	5	12"	6	12"	.....	.....	4"	3"	7/16"
18'-6½"	13	3	4	16"	5	16"	4	16"	.....	.....	3"	2½"	7/16"
18'-7½"	13	3	4	16"	5	16"	4	16"	.....	.....	3½"	3"	7/16"
18'-7½"	16	4	5	12"	3	14"	3	14"	5	12"	3"	2½"	½"
18'-8½"	13	3	4	16"	5	16"	4	16"	.....	.....	4"	3"	7/16"
18'-9"	16	4	5	12"	3	14"	3	14"	5	12"	3½"	3"	½"
18'-9½"	15	3	5	14"	5	14"	5	14"	.....	.....	3"	2½"	7/16"
18'-10½"	15	3	5	14"	5	14"	5	14"	.....	.....	3½"	3"	7/16"
18'-10½"	14	4	4	14"	3	16"	3	16"	4	14"	3"	2½"	½"
18'-10½"	16	4	5	12"	3	14"	3	14"	5	12"	4"	3"	½"
18'-11½"	16	4	4	14"	4	12"	4	12"	4	14"	3"	3"	½"
18'-11½"	15	3	5	14"	5	14"	5	14"	.....	.....	4"	3"	7/16"
19'-0"	14	4	4	14"	3	16"	3	16"	4	14"	3"	2½"	½"
19'-0"	16	3	5	14"	6	12"	5	14"	.....	.....	3"	2½"	7/16"
19'-1"	16	3	4	14"	4	12"	4	12"	4	14"	3½"	3"	½"
19'-1"	16	3	5	14"	6	12"	5	14"	.....	.....	3½"	3"	½"
19'-1½"	14	4	4	14"	3	16"	3	16"	4	14"	4"	3"	7/16"
19'-2"	16	3	5	14"	6	12"	5	14"	.....	.....	4"	3"	7/16"
19'-2½"	16	4	4	14"	4	12"	4	12"	4	14"	4"	3"	½"
19'-2½"	17	3	6	12"	5	14"	6	12"	.....	.....	3"	2½"	7/16"
19'-3"	14	3	5	16"	4	14"	5	16"	.....	.....	3"	2½"	7/16"
19'-3½"	17	3	6	12"	5	14"	6	12"	.....	.....	3½"	3"	7/16"
19'-3½"	15	3	6	14"	3	16"	6	14"	.....	.....	3"	2½"	7/16"
19'-4"	14	3	5	16"	4	14"	5	16"	.....	.....	3½"	3"	7/16"
19'-4"	16	3	6	14"	4	12"	6	14"	.....	.....	3"	2½"	7/16"
19'-4½"	17	3	6	12"	5	14"	6	12"	.....	.....	4"	3"	7/16"
19'-4½"	15	3	6	14"	3	16"	6	14"	.....	.....	3½"	3"	7/16"
19'-5"	14	3	5	16"	4	14"	5	16"	.....	.....	4"	3"	7/16"
19'-5"	16	3	6	14"	4	12"	6	14"	.....	.....	3½"	3"	7/16"
19'-5"	18	3	6	12"	6	12"	6	12"	.....	.....	3"	2½"	7/16"
19'-5½"	15	3	6	14"	3	16"	6	14"	.....	.....	4"	3"	7/16"
19'-6"	16	3	6	14"	4	12"	6	14"	.....	.....	4"	3"	7/16"
19'-6"	18	3	6	12"	6	12"	6	12"	.....	.....	3½"	3"	7/16"

Continued on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

TABLE NO. 3—Continued

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Width of Mullion Plates	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
19 '-7"	18	3	6	12"	6	12"	6	12"	.....	.....	4"	3"	7/16"
19 '-7½"	15	3	5	14"	5	16"	5	14"	.....	.....	3"	2½"	7/16"
19 '-8½"	15	3	5	14"	5	16"	5	14"	.....	.....	3½"	3"	7/16"
19 '-8½"	18	4	4	12"	5	12"	5	12"	4	12"	3"	2½"	½"
19 '-9½"	15	3	5	14"	5	16"	5	14"	.....	.....	4"	3"	7/16"
19 '-10"	18	4	4	12"	5	12"	5	12"	4	12"	3½"	3"	½"
19 '-11"	14	3	5	16"	4	16"	5	16"	.....	.....	3"	2½"	7/16"
19 '-11½"	18	4	4	12"	5	12"	5	12"	4	12"	4"	3"	½"
20 '-0"	14	3	5	16"	4	16"	5	16"	.....	.....	3½"	3"	7/16"
20 '-0"	16	3	5	14"	6	14"	5	14"	.....	.....	3"	2½"	7/16"
20 '-1"	14	3	5	16"	4	16"	5	16"	.....	.....	4"	3"	7/16"
20 '-1"	16	3	5	14"	6	14"	5	14"	.....	.....	3½"	3"	7/16"
20 '-2"	16	3	5	14"	6	14"	5	14"	.....	.....	4"	3"	7/16"
20 '-2½"	14	4	3	16"	4	16"	4	16"	3	16"	3"	2½"	½"
20 '-3½"	16	4	4	14"	4	14"	4	14"	4	14"	3"	2½"	½"
20 '-4"	14	4	3	16"	4	16"	4	16"	3	16"	3½"	3"	½"
20 '-4½"	17	3	6	14"	5	12"	6	14"	.....	.....	3"	2½"	7/16"
20 '-5"	16	4	4	14"	4	14"	4	14"	4	14"	3½"	3"	½"
20 '-5"	18	3	6	12"	6	14"	6	12"	.....	.....	3"	2½"	7/16"
20 '-5½"	14	4	3	16"	4	16"	4	16"	3	16"	4"	3"	½"
20 '-5½"	15	3	5	16"	5	14"	5	16"	.....	.....	3"	2½"	7/16"
20 '-5½"	17	3	6	14"	5	12"	6	14"	.....	.....	3½"	3"	7/16"
20 '-6"	18	3	6	12"	6	14"	6	12"	.....	.....	3½"	3"	7/16"
20 '-6½"	16	4	4	14"	4	14"	4	14"	4	14"	4"	3"	½"
20 '-6½"	15	3	5	16"	5	14"	5	16"	.....	.....	3½"	3"	7/16"
20 '-6½"	17	3	6	14"	5	14"	6	14"	.....	.....	4"	3"	7/16"
20 '-7"	18	3	6	12"	6	14"	6	12"	.....	.....	4"	3"	7/16"
20 '-7½"	15	3	5	16"	5	14"	5	16"	.....	.....	4"	3"	7/16"
20 '-8½"	18	4	6	12"	3	14"	3	14"	6	12"	3"	2½"	½"
20 '-10"	18	4	6	12"	3	14"	3	14"	6	12"	3½"	3"	½"
20 '-11½"	18	4	6	12"	3	14"	3	14"	6	12"	4"	3"	½"
21 '-0½"	18	4	4	14"	5	12"	5	12"	4	14"	3"	2½"	½"
21 '-2"	18	4	4	14"	5	12"	5	12"	4	14"	3½"	3"	½"
21 '-3½"	18	4	4	14"	5	12"	5	12"	4	14"	4"	3"	½"
21 '-3½"	15	3	5	16"	5	16"	5	16"	.....	.....	3"	2½"	7/16"
21 '-4½"	18	4	4	12"	5	14"	5	14"	4	12"	3"	2½"	½"
21 '-4½"	15	3	5	16"	5	16"	5	16"	.....	.....	3½"	3"	7/16"
21 '-5½"	15	3	5	16"	5	16"	5	16"	.....	.....	4"	3"	7/16"
21 '-6½"	18	4	4	12"	5	14"	5	14"	4	12"	3½"	3"	½"
21 '-7½"	16	4	4	14"	4	16"	4	16"	4	14"	3"	2½"	½"
21 '-7½"	18	4	4	12"	5	14"	5	14"	4	12"	4"	3"	½"
21 '-9"	16	4	4	14"	4	16"	4	16"	4	14"	3½"	3"	½"
21 '-9½"	20	4	5	12"	5	12"	5	12"	5	12"	3"	2½"	½"
21 '-10½"	16	4	4	14"	4	16"	4	16"	4	14"	4"	3"	½"
21 '-11"	20	4	5	12"	5	12"	5	12"	5	12"	3½"	3"	½"
22 '-0½"	20	4	5	12"	5	12"	5	12"	5	12"	4"	3"	½"
22 '-0½"	17	3	6	14"	5	16"	6	14"	.....	.....	3"	2½"	7/16"
22 '-1½"	17	3	6	14"	5	16"	6	14"	.....	.....	3½"	3"	7/16"
22 '-2½"	17	3	6	14"	5	16"	6	14"	.....	.....	4"	3"	7/16"
22 '-5"	18	3	6	14"	6	14"	6	14"	.....	.....	3"	2½"	7/16"
22 '-6"	18	3	6	14"	6	14"	6	14"	.....	.....	3½"	3"	7/16"
22 '-6½"	21	3	7	12"	7	12"	7	12"	.....	.....	3"	2½"	7/16"
22 '-7"	18	3	6	14"	6	14"	6	14"	.....	.....	4"	3"	7/16"
22 '-7½"	21	3	7	12"	7	12"	7	12"	.....	.....	3½"	3"	7/16"
22 '-8½"	21	3	7	12"	7	12"	7	12"	.....	.....	4"	3"	7/16"
22 '-8½"	18	4	4	14"	5	14"	5	14"	4	14"	3"	2½"	½"
22 '-10"	18	4	4	14"	5	14"	5	14"	4	14"	3½"	3"	½"
22 '-11½"	18	4	4	14"	5	14"	5	14"	4	14"	4"	3"	½"
22 '-11½"	16	4	4	16"	4	16"	4	16"	4	16"	3"	2½"	½"
23 '-1"	16	4	4	16"	4	16"	4	16"	4	16"	3½"	3"	½"
23 '-1½"	20	4	6	12"	4	14"	4	14"	6	12"	3"	2½"	½"
23 '-2½"	16	4	4	16"	4	16"	4	16"	4	16"	4"	3"	½"
23 '-3"	20	4	6	12"	4	14"	4	14"	6	12"	3½"	3"	½"
23 '-4½"	20	4	6	12"	4	14"	4	14"	6	12"	4"	3"	½"

Concluded on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Expandable Mullions

TABLE NO. 3—Concluded

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Width of Mullion Plates	Mullion Distance	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass			
23 '-5½"	20	4	5	12"	5	14"	5	14"	5	12"	3"	2½"	½"
23 '-7"	20	4	5	12"	5	14"	5	14"	5	12"	3½"	3"	½"
23 '-8½"	20	4	5	12"	5	14"	5	14"	5	12"	4"	3"	½"
23 '-8½"	18	4	3	16"	6	14"	6	14"	3	16"	3"	2½"	½"
23 '-9½"	20	4	4	12"	6	14"	6	14"	4	12"	3"	2½"	½"
23 '-10"	18	4	3	16"	6	14"	6	14"	3	16"	3½"	3"	½"
23 '-10½"	22	4	5	12"	6	12"	6	12"	5	12"	3"	2½"	½"
23 '-11"	20	4	4	12"	6	14"	6	14"	4	12"	3½"	3"	½"
23 '-11½"	18	4	3	16"	6	14"	6	14"	3	16"	4"	3"	½"
24 '-0"	22	4	5	12"	6	12"	6	12"	5	12"	3½"	3"	½"
24 '-0½"	20	4	4	12"	6	14"	6	14"	4	12"	4"	3"	½"
24 '-0½"	18	4	4	16"	5	14"	5	14"	4	16"	3"	2½"	½"
24 '-1½"	22	4	5	12"	6	12"	6	12"	5	12"	4"	3"	½"
24 '-2"	18	4	4	16"	5	14"	5	14"	4	16"	3½"	3"	½"
24 '-3½"	18	4	4	16"	5	14"	5	14"	4	16"	4"	3"	½"
24 '-4½"	18	4	4	14"	5	16"	5	16"	4	14"	3"	2½"	½"
24 '-6"	18	4	4	14"	5	16"	5	16"	4	14"	3½"	3"	½"
24 '-7½"	18	4	4	14"	5	16"	5	16"	4	14"	4"	3"	½"
25 '-1½"	20	4	5	14"	5	14"	5	14"	5	14"	3"	2½"	½"
25 '-3"	20	4	5	14"	5	14"	5	14"	5	14"	3½"	3"	½"
25 '-4½"	20	4	5	14"	5	14"	5	14"	5	14"	4"	3"	½"
25 '-6½"	22	4	5	14"	6	12"	6	12"	5	14"	3"	2½"	½"
25 '-8"	22	4	5	14"	6	12"	6	12"	5	14"	3½"	3"	½"
25 '-8½"	18	4	4	16"	5	16"	5	16"	4	16"	3"	2½"	½"
25 '-9½"	22	4	5	14"	6	12"	6	12"	5	14"	4"	3"	½"
25 '-10"	18	4	4	16"	5	16"	5	16"	4	16"	3½"	3"	½"
25 '-10½"	22	4	5	12"	6	14"	6	14"	5	12"	3"	2½"	½"
25 '-11½"	18	4	4	16"	5	16"	5	16"	4	16"	4"	3"	½"
25 '-11½"	24	4	6	12"	6	12"	6	12"	6	12"	3"	2½"	½"
26 '-0"	22	4	5	12"	6	14"	6	14"	5	12"	4"	3"	½"
26 '-1"	24	4	6	12"	6	12"	6	12"	6	12"	3½"	3"	½"
26 '-1½"	22	4	5	12"	6	14"	6	14"	5	12"	4"	3"	½"
26 '-2½"	24	4	6	12"	6	12"	6	12"	6	12"	4"	3"	½"
26 '-5½"	20	4	4	16"	6	14"	6	14"	4	16"	3"	2½"	½"
26 '-7"	20	4	4	16"	6	14"	6	14"	4	16"	3½"	3"	½"
26 '-8½"	20	4	4	16"	6	14"	6	14"	4	16"	4"	3"	½"
26 '-9½"	20	4	5	14"	5	16"	5	16"	5	14"	3"	2½"	½"
26 '-11"	20	4	5	14"	5	16"	5	16"	5	14"	3½"	3"	½"
27 '-0½"	20	4	5	14"	5	16"	5	16"	5	14"	4"	3"	½"
27 '-6½"	22	4	5	14"	6	14"	6	14"	5	14"	3"	2½"	½"
27 '-8"	22	4	5	14"	6	14"	6	14"	5	14"	3½"	3"	½"
27 '-9½"	22	4	5	14"	6	14"	6	14"	5	14"	4"	3"	½"
27 '-11½"	24	4	6	12"	6	14"	6	14"	6	12"	3"	2½"	½"
28 '-1"	24	4	6	12"	6	14"	6	14"	6	12"	3½"	3"	½"
28 '-2½"	24	4	6	12"	6	14"	6	14"	6	12"	4"	3"	½"
28 '-5½"	20	4	5	16"	5	16"	5	16"	5	16"	3"	2½"	½"
28 '-7"	20	4	5	16"	5	16"	5	16"	5	16"	3½"	3"	½"
28 '-8½"	20	4	5	16"	5	16"	5	16"	5	16"	4"	3"	½"
29 '-2½"	22	4	5	16"	6	14"	6	14"	5	16"	3"	2½"	½"
29 '-4"	22	4	5	16"	6	14"	6	14"	5	16"	3½"	3"	½"
29 '-5½"	22	4	5	16"	6	14"	6	14"	5	16"	4"	3"	½"
29 '-11½"	24	4	6	14"	6	14"	6	14"	6	14"	3"	2½"	½"
30 '-1"	24	4	6	14"	6	14"	6	14"	6	14"	3½"	3"	½"
30 '-2½"	24	4	6	14"	6	14"	6	14"	6	14"	4"	3"	½"

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Type A Mullions

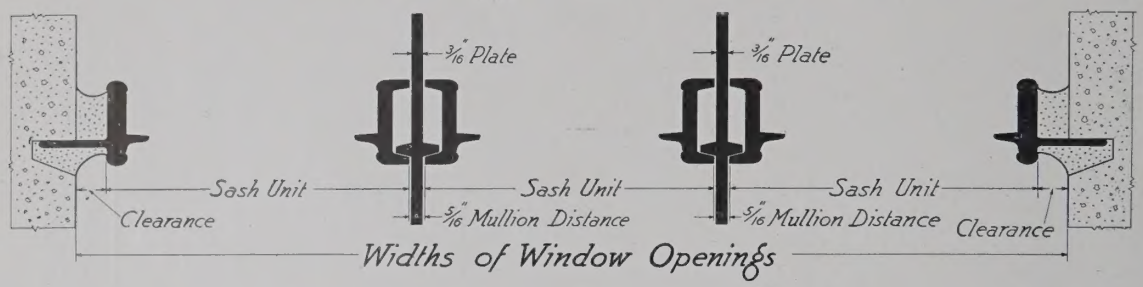


TABLE NO. 4

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass		
3'-3"	3	1	3	12"								9/16"
3'-9"	3	1	3	14"								9/16"
4'-3"	3	1	3	16"								9/16"
4'-3½"	4	1	4	12"								9/16"
4'-11½"	4	1	4	14"								9/16"
5'-4"	5	1	5	12"								9/16"
5'-7½"	4	1	4	16"								9/16"
6'-2"	5	1	5	14"								9/16"
6'-4½"	6	1	6	12"								9/16"
6'-5½"	6	2	3	12"	3	12"					5/16"	1/2"
7'-0"	5	1	5	16"								9/16"
7'-4½"	6	1	6	14"								9/16"
7'-5"	7	1	7	12"								9/16"
7'-5½"	6	2	3	14"	3	14"					5/16"	1/2"
8'-5½"	6	2	3	16"	3	16"					5/16"	1/2"
8'-6½"	8	2	4	12"	4	12"					5/16"	1/2"
9'-8"	9	3	3	12"	3	12"	3	12"			5/16"	1/2"
9'-10½"	8	2	4	14"	4	14"					5/16"	1/2"
10'-2"	9	3	3	12"	3	14"	3	12"			5/16"	1/2"
10'-7½"	10	2	5	12"	5	12"					5/16"	1/2"
10'-8"	9	3	3	14"	3	12"	3	14"			5/16"	1/2"
10'-8½"	10	3	3	12"	4	12"	3	12"			5/16"	1/2"
11'-2"	9	3	3	14"	3	14"	3	14"			5/16"	1/2"
11'-2½"	8	2	4	16"	4	16"					5/16"	1/2"
11'-4½"	10	3	3	12"	4	14"	3	12"			5/16"	1/2"
11'-8"	9	3	3	14"	3	16"	3	14"			5/16"	1/2"
11'-8½"	10	3	3	14"	4	12"	3	14"			5/16"	1/2"
11'-9"	11	3	3	12"	5	12"	3	12"			5/16"	1/2"
12'-2"	9	3	3	16"	3	14"	3	16"			5/16"	1/2"
12'-3"	11	3	4	12"	3	14"	4	12"			5/16"	1/2"
12'-3½"	10	2	5	14"	5	14"					5/16"	1/2"
12'-4½"	10	3	3	14"	4	14"	3	14"			1/2"	1/2"
12'-8"	9	3	3	16"	3	16"	3	16"			5/16"	1/2"
12'-8½"	12	2	6	12"	6	12"					5/16"	1/2"
12'-9"	11	3	3	14"	5	12"	3	14"			5/16"	1/2"
12'-9½"	12	3	4	12"	4	12"	4	12"			5/16"	1/2"
12'-10½"	12	4	3	12"	3	12"	3	12"	3	12"	5/16"	1/2"
13'-0½"	10	3	3	14"	4	16"	3	14"			5/16"	1/2"
13'-1"	11	3	4	14"	3	12"	4	14"			5/16"	1/2"
13'-4½"	10	3	3	16"	4	14"	3	16"			5/16"	1/2"
13'-7"	11	3	3	14"	5	14"	3	14"			5/16"	1/2"
13'-9½"	12	3	3	14"	6	12"	3	14"			5/16"	1/2"
13'-10"	13	3	4	12"	5	12"	4	12"			5/16"	1/2"
13'-11½"	10	2	5	16"	5	16"					5/16"	1/2"
14'-0½"	10	3	3	16"	4	16"	3	16"			5/16"	1/2"

Continued on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Type A Mullions

TABLE NO. 4—Continued

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass		
14 '-1"	11	3	4	14"	3	16"	4	14"	.....	.....	5/16"	1/2"
14 '-1 1/2"	12	3	4	14"	4	12"	4	14"	.....	.....	5/16"	1/2"
14 '-4"	13	3	5	12"	3	14"	5	12"	.....	.....	5/16"	1/2"
14 '-5"	11	3	3	14"	5	16"	3	14"	.....	.....	5/16"	1/2"
14 '-7"	11	3	3	16"	5	14"	3	16"	.....	.....	5/16"	1/2"
14 '-8"	13	3	4	12"	5	14"	4	12"	.....	.....	5/16"	1/2"
14 '-8 1/2"	12	2	6	14"	6	14"	.....	.....	.....	.....	5/16"	1/2"
14 '-9 1/2"	12	3	4	14"	4	14"	4	14"	.....	.....	5/16"	1/2"
14 '-10"	13	3	3	14"	7	12"	3	14"	.....	.....	5/16"	1/2"
14 '-10 1/2"	12	4	3	14"	3	14"	3	14"	3	14"	5/16"	7/16"
14 '-10 1/2"	14	3	4	12"	6	12"	4	12"	.....	.....	5/16"	1/2"
14 '-11"	11	3	4	16"	3	14"	4	16"	.....	.....	5/16"	1/2"
14 '-11 1/2"	14	4	3	12"	4	12"	4	12"	3	12"	5/16"	7/16"
15 '-2"	13	3	4	14"	5	12"	4	14"	.....	.....	5/16"	1/2"
15 '-5"	11	3	3	16"	5	16"	3	16"	.....	.....	5/16"	1/2"
15 '-5 1/2"	12	3	4	14"	4	16"	4	14"	.....	.....	5/16"	1/2"
15 '-6 1/2"	14	3	5	12"	4	14"	5	12"	.....	.....	5/16"	1/2"
15 '-9 1/2"	12	3	3	16"	6	14"	3	16"	.....	.....	5/16"	1/2"
15 '-10 1/2"	12	4	3	16"	3	14"	3	14"	3	16"	5/16"	7/16"
15 '-10 1/2"	14	3	4	12"	6	14"	4	12"	.....	.....	5/16"	1/2"
15 '-11"	15	3	5	12"	5	12"	5	12"	.....	.....	5/16"	7/16"
15 '-11 1/2"	14	4	3	14"	4	12"	4	12"	3	14"	5/16"	1/2"
16 '-0"	13	3	4	14"	5	14"	4	14"	.....	.....	5/16"	1/2"
16 '-3 1/2"	14	4	3	12"	4	14"	4	14"	3	12"	5/16"	7/16"
16 '-5"	15	3	6	12"	3	14"	6	12"	.....	.....	5/16"	1/2"
16 '-6"	13	3	5	14"	3	16"	5	14"	.....	.....	5/16"	1/2"
16 '-6 1/2"	14	3	5	14"	4	12"	5	14"	.....	.....	5/16"	1/2"
16 '-9"	15	3	5	12"	5	14"	5	12"	.....	.....	5/16"	1/2"
16 '-9 1/2"	12	3	4	16"	4	16"	4	16"	.....	.....	5/16"	1/2"
16 '-10"	13	3	4	14"	5	16"	4	14"	.....	.....	5/16"	1/2"
16 '-10 1/2"	12	4	3	16"	3	16"	3	16"	3	16"	5/16"	7/16"
16 '-11 1/2"	16	3	5	12"	6	12"	5	12"	.....	.....	5/16"	1/2"
17 '-0 1/2"	16	4	4	12"	4	12"	4	12"	4	12"	5/16"	7/16"
17 '-2 1/2"	14	3	5	14"	4	14"	5	14"	.....	.....	5/16"	1/2"
17 '-2 1/2"	14	3	4	14"	6	14"	4	14"	.....	.....	5/16"	1/2"
17 '-3 1/2"	14	4	3	14"	4	14"	4	14"	3	14"	5/16"	7/16"
17 '-7"	15	3	5	14"	5	12"	5	14"	.....	.....	5/16"	1/2"
17 '-8"	13	3	5	16"	3	14"	5	16"	.....	.....	5/16"	1/2"
17 '-10 1/2"	14	3	5	14"	4	16"	5	14"	.....	.....	5/16"	1/2"
17 '-11 1/2"	16	3	5	12"	6	14"	5	12"	.....	.....	5/16"	1/2"
18 '-0"	17	3	6	12"	5	12"	6	12"	.....	.....	5/16"	1/2"
18 '-0 1/2"	16	4	5	12"	3	14"	3	14"	5	12"	5/16"	7/16"
18 '-2"	13	3	4	16"	5	16"	4	16"	.....	.....	5/16"	1/2"
18 '-3 1/2"	14	4	4	14"	3	16"	3	16"	4	14"	5/16"	7/16"
18 '-4 1/2"	16	4	4	14"	4	12"	4	12"	4	14"	5/16"	7/16"
18 '-5"	15	3	5	14"	5	14"	5	14"	.....	.....	5/16"	1/2"
18 '-7 1/2"	16	3	5	14"	6	12"	5	14"	.....	.....	5/16"	1/2"
18 '-7 1/2"	14	4	4	16"	3	14"	3	14"	4	16"	5/16"	7/16"
18"-8 1/2"	16	4	5	14"	3	12"	3	12"	5	14"	5/16"	7/16"
18 '-10"	17	3	6	12"	5	14"	6	12"	.....	.....	5/16"	1/2"
18 '-10 1/2"	14	3	5	16"	4	14"	5	16"	.....	.....	5/16"	1/2"
18 '-11"	15	3	6	14"	3	16"	6	14"	.....	.....	5/16"	1/2"
18 '-11 1/2"	16	3	6	14"	4	12"	6	14"	.....	.....	5/16"	1/2"
19 '-0 1/2"	18	3	6	12"	6	12"	6	12"	.....	.....	5/16"	1/2"
19 '-1 1/2"	18	4	4	12"	5	12"	5	12"	4	12"	5/16"	7/16"
19 '-3"	15	3	5	14"	5	16"	5	14"	.....	.....	5/16"	1/2"
19 '-6 1/2"	14	3	5	16"	4	16"	5	16"	.....	.....	5/16"	1/2"
19 '-7 1/2"	16	3	5	14"	6	14"	5	14"	.....	.....	5/16"	1/2"
19 '-7 1/2"	14	4	3	16"	4	16"	4	16"	3	16"	5/16"	7/16"
19 '-8 1/2"	16	4	4	14"	4	14"	4	14"	4	14"	5/16"	7/16"
20 -1 1/2"	18	4	3	14"	6	12"	6	12"	3	14"	5/16"	7/16"
20 '-5 1/2"	18	4	4	14"	5	12"	5	12"	4	14"	5/16"	7/16"
20 '-8 1/2"	16	4	3	16"	5	14"	5	14"	3	16"	5/16"	7/16"
20 '-9 1/2"	18	4	4	12"	5	14"	5	14"	4	12"	5/16"	7/16"

Concluded on next page.

Note—See page 40 for table of heights.

Widths of Window Openings for Semi-Stock Sash with Type A Mullions

TABLE NO. 4—Concluded

Width of Window Opening	Total No. of Lights	No. of Units	1st Unit		2nd Unit		3rd Unit		4th Unit		Mullion Distance	Clearance at Each Jamb
			No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass	No. of Lights Wide	Width of Glass		
20 '-10"	17	3	6	14"	5	14"	6	14"	.....	.....	5/16"	1/2"
20 '-11"	15	3	5	16"	5	16"	5	16"	.....	.....	5/16"	1/2"
21 '-0 1/2"	16	4	4	14"	4	16"	4	16"	4	14"	5/16"	7/16"
21 '-2 1/2"	20	4	5	12"	5	12"	5	12"	5	12"	5/16"	7/16"
21 '-3 1/2"	16	3	5	16"	6	14"	5	16"	.....	.....	5/16"	1/2"
21 '-4 1/2"	16	4	3	14"	5	16"	5	16"	3	14"	5/16"	7/16"
21 '-8"	17	3	6	14"	5	16"	6	14"	.....	.....	5/16"	1/2"
22 '-0 1/2"	18	3	6	14"	6	14"	6	14"	.....	.....	5/16"	1/2"
22 '-1 1/2"	20	3	7	12"	6	14"	7	12"	.....	.....	5/16"	1/2"
22 '-1 1/2"	18	4	4	14"	5	14"	5	14"	4	14"	5/16"	7/16"
22 '-2"	21	3	7	12"	7	12"	7	12"	.....	.....	5/16"	1/2"
22 '-4 1/2"	16	4	4	16"	4	16"	4	16"	4	16"	5/16"	7/16"
22 '-10 1/2"	20	4	5	12"	5	14"	5	14"	5	12"	5/16"	7/16"
23 '-1 1/2"	18	4	3	16"	6	14"	6	14"	3	16"	5/16"	7/16"
23 '-2 1/2"	20	4	4	12"	6	14"	6	14"	4	12"	5/16"	7/16"
23 '-3 1/2"	22	4	5	12"	6	12"	6	12"	5	12"	5/16"	7/16"
23 '-5 1/2"	18	4	4	16"	5	14"	5	14"	4	16"	5/16"	7/16"
23 '-9 1/2"	18	4	4	14"	5	16"	5	16"	4	14"	5/16"	7/16"
24 '-6 1/2"	20	4	5	14"	5	14"	5	14"	5	14"	5/16"	7/16"
24 '-11 1/2"	22	4	5	14"	6	12"	6	12"	5	14"	5/16"	7/16"
25 '-1 1/2"	18	4	4	16"	5	16"	5	16"	4	16"	5/16"	7/16"
25 '-3 1/2"	22	4	5	12"	6	14"	6	14"	5	12"	5/16"	7/16"
25 '-4 1/2"	24	4	6	12"	6	12"	6	12"	6	12"	5/16"	7/16"
25 '-10 1/2"	20	4	4	16"	6	14"	6	14"	4	16"	5/16"	7/16"
26 '-2 1/2"	20	4	5	14"	5	16"	5	16"	5	14"	5/16"	7/16"
26 '-11 1/2"	22	4	5	14"	6	14"	6	14"	5	14"	5/16"	7/16"
27 '-10 1/2"	20	4	5	16"	5	16"	5	16"	5	16"	5/16"	7/16"
28 '-7 1/2"	22	4	5	16"	6	14"	6	14"	5	16"	5/16"	7/16"
29 '-4 1/2"	24	4	6	14"	6	14"	6	14"	6	14"	5/16"	7/16"
29 '-6 1/2"	28	4	7	12"	7	12"	7	12"	7	12"	5/16"	7/16"

Heights of Window Openings

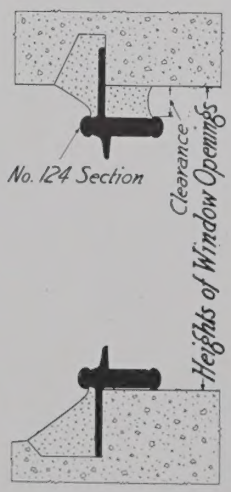
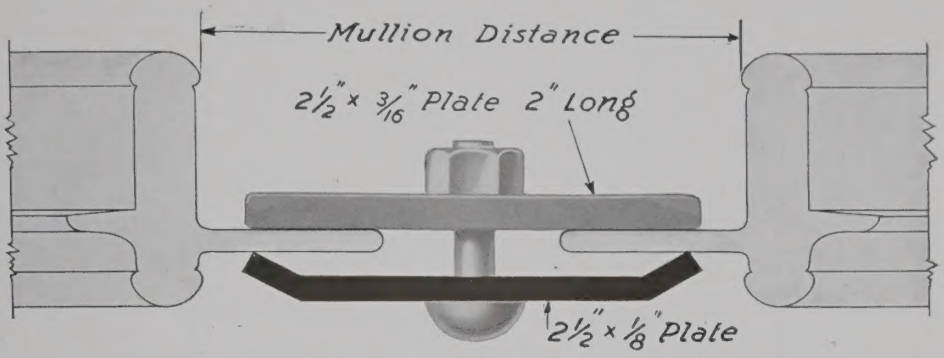


TABLE NO. 5

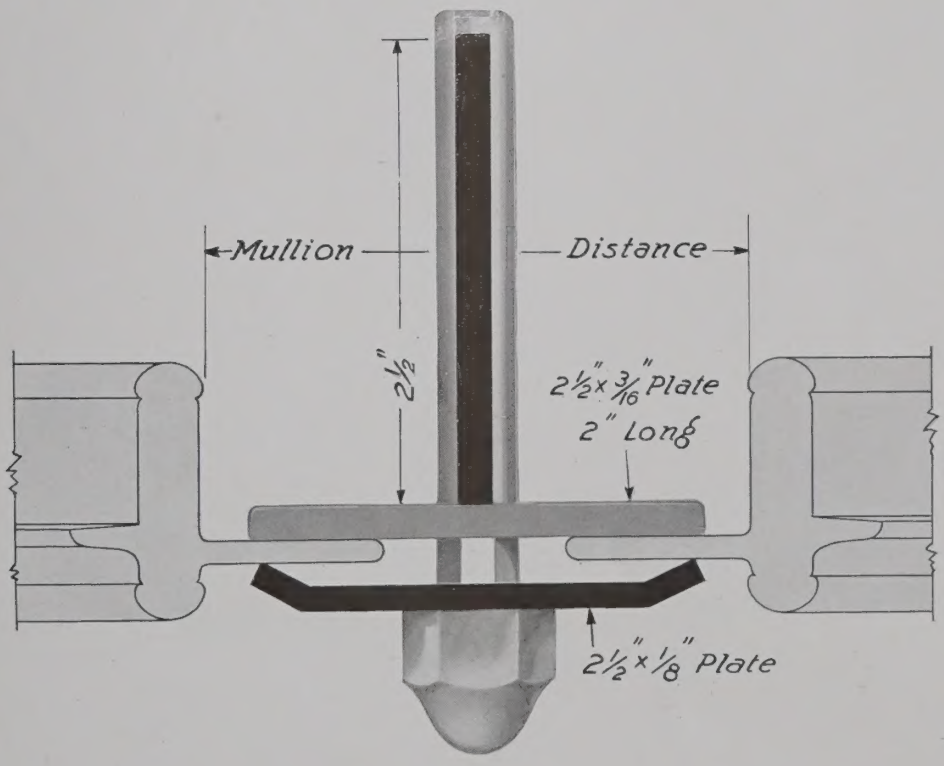
No. of Lights High	Height of Glass		
	18"	20"	22"
2	3 '-2"	3 '-6"	3 '-10"
3	4 '-8 1/2"	5 '-2 1/2"	5 '-8 1/2"
4	6 '-3"	6 '-11"	7 '-7"
5	7 '-9 1/2"	8 '-7 1/2"	9 '-5 1/2"
6	9 '-4"	10 '-4"	11 '-4"
7	10 '-10 1/2"	*12 '-0 1/2"	†13 '-2 1/2"
8	*12 '-5"	‡13 '-9"	
9	‡13 '-11 1/2"		

*Sash 12 '-0 1/2" or 12 '-5" high should not be wider than 6 lights of 12" glass or 5 lights of 14" glass or 5 lights of 16" glass.
†Sash 13 '-2 1/2" high should not be wider than 5 lights of 12" glass or 5 lights of 14" glass or 4 lights of 16" glass.
‡Sash 13 '-9" or 13 '-11 1/2" high should not be wider than 5 lights of 12" glass or 4 "lights of 14 glass or 4 lights of 16" glass.



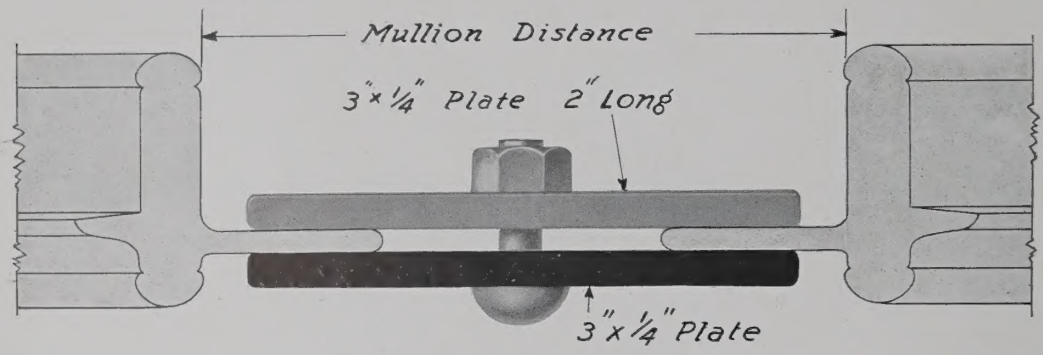
TYPE S-1 MULLION

Used with Semi-Stock Sash up to 6 '–0" in height and mullion distance of 3".



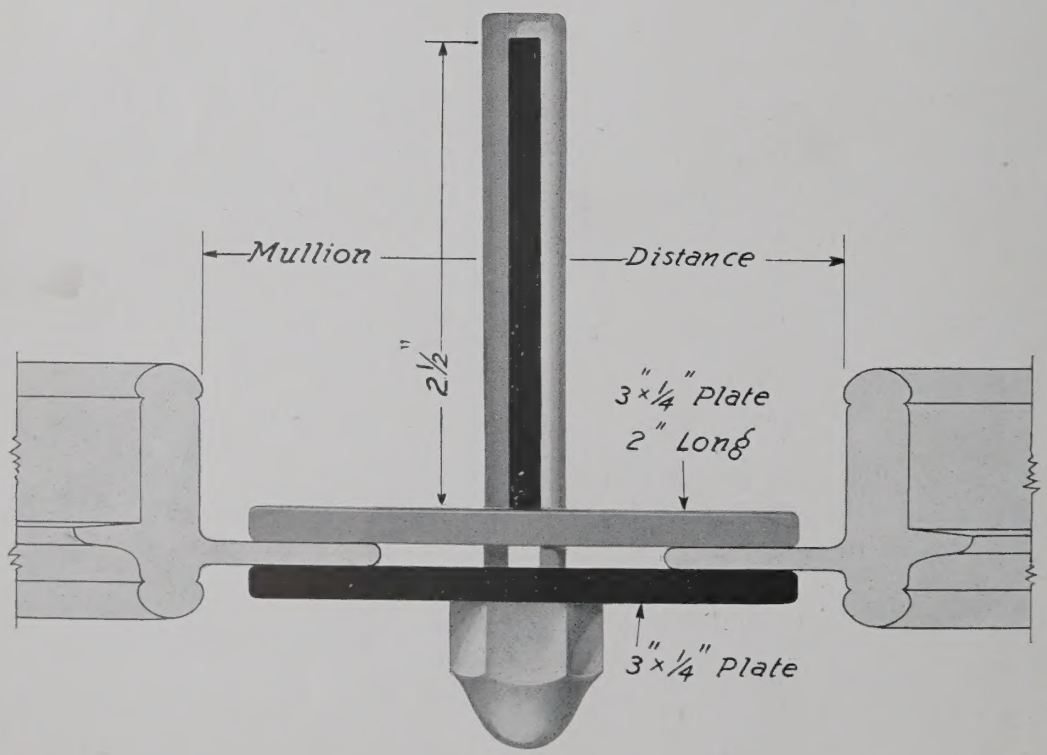
TYPE S-3 MULLION

Used with Semi-Stock Sash from 6 '–0" to 9 '–0" in height and mullion distance of 3".



TYPE S-2 MULLION

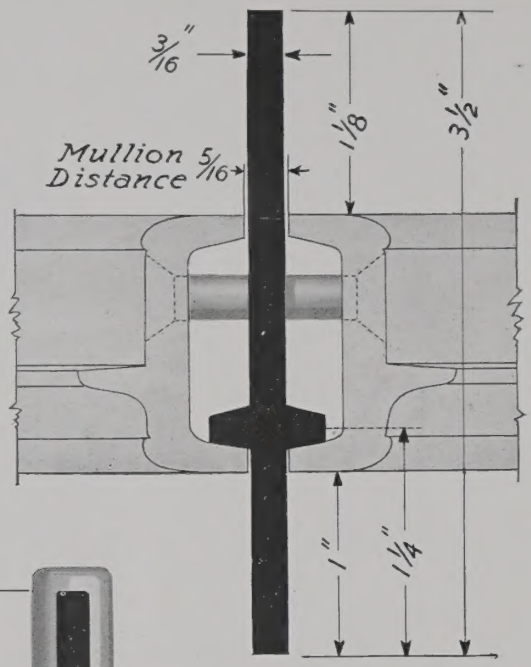
Used with Semi-Stock Sash up to 6'–0" in height and mullion distance of 3½" and 4".



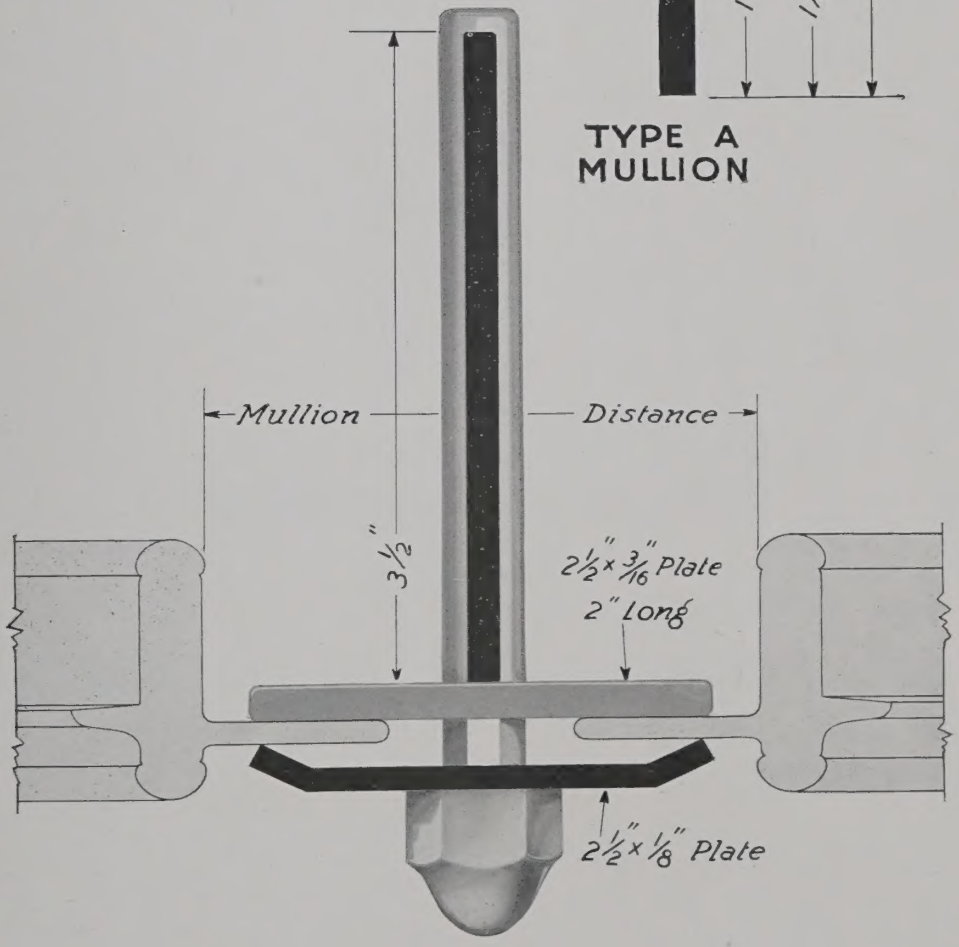
TYPE S-4 MULLION

Used with Semi-Stock Sash from 6'–0" to 9'–0" in height and mullion distance of 3½" and 4".

Type A Mullion is used with Semi-Stock Sash up to 14′–0″ in height

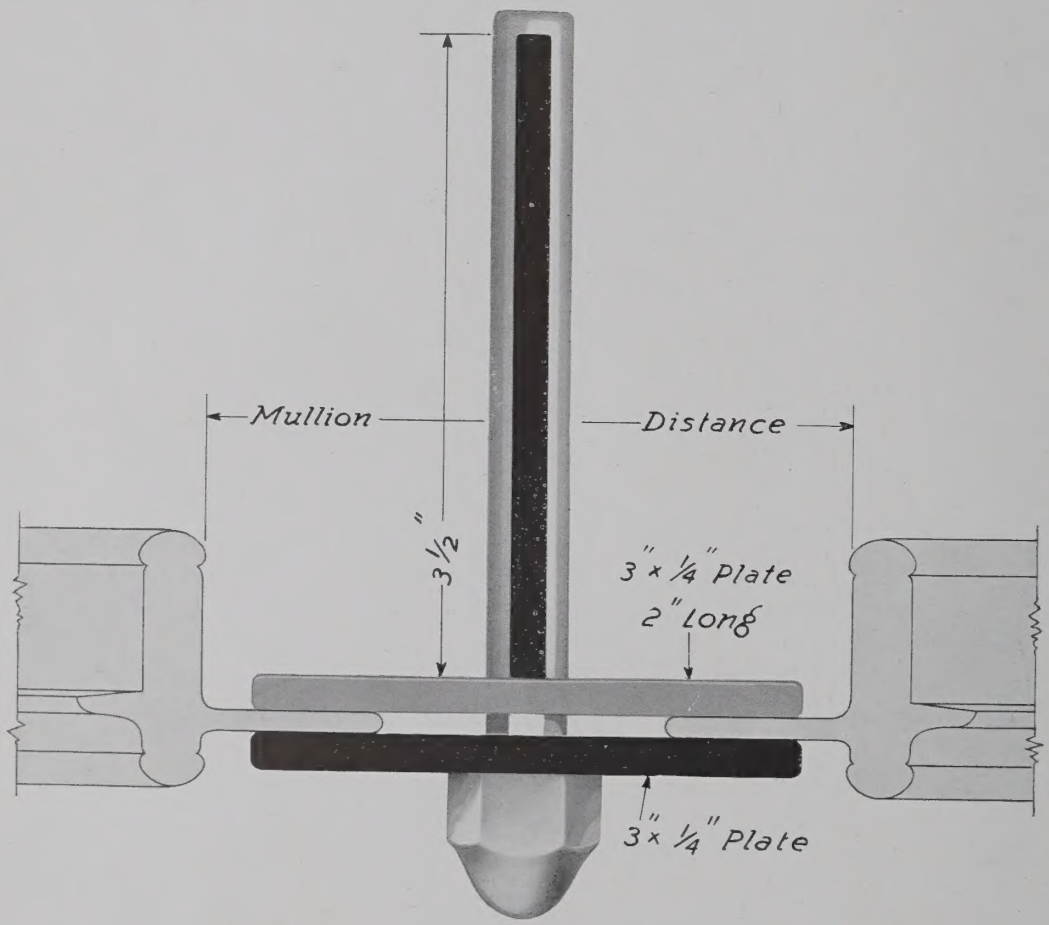


TYPE A MULLION



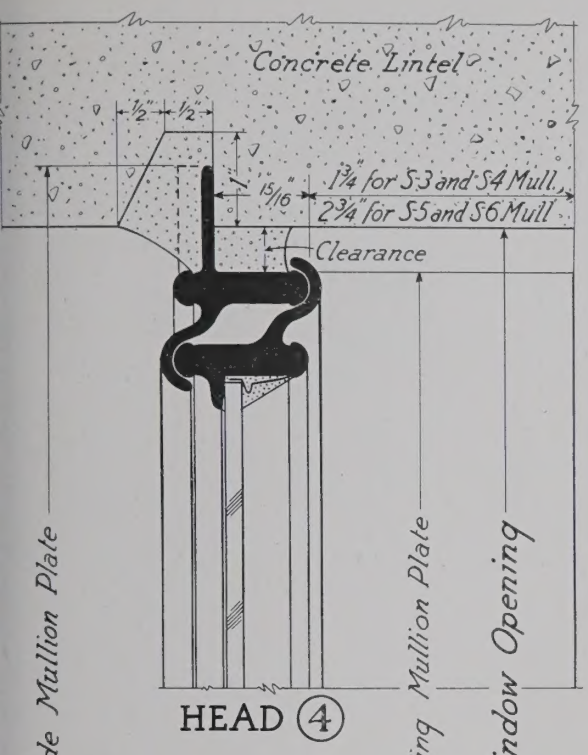
TYPE S-5 MULLION

Used with Semi-Stock Sash over 9′–0″ in height and mullion distance of 3″.

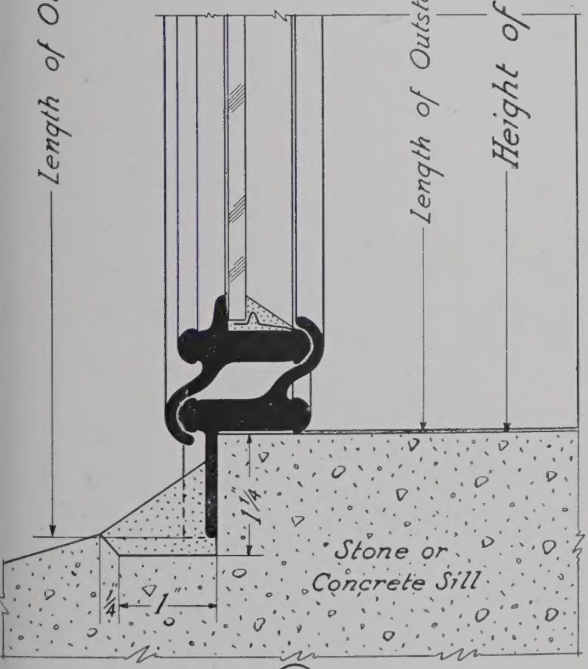


TYPE S-6 MULLION

Used with Semi-Stock Sash over 9'–0" in height and mullion distance of 3½" and 4".

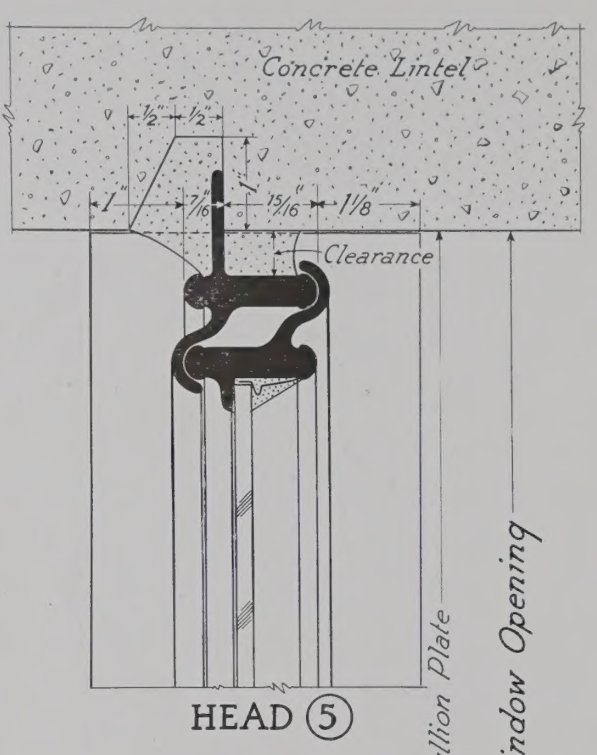


HEAD (4)

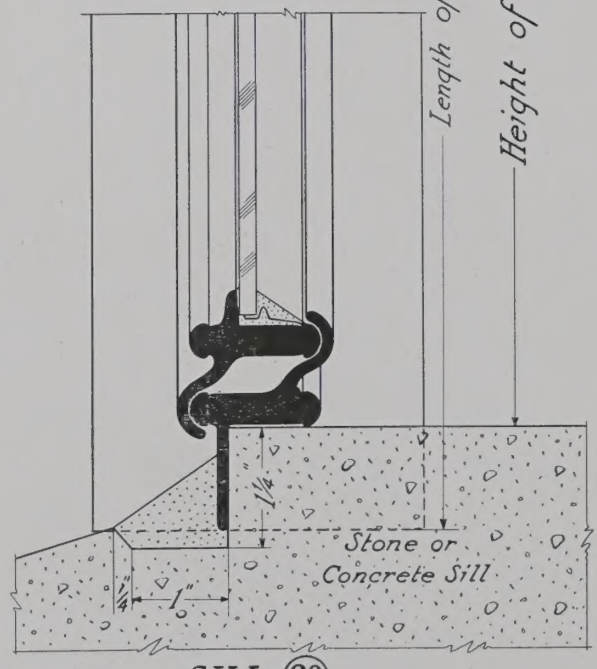


SILL (19)

Detail with Mullions Type S-1, S-2, S-3, S-4, S-5 and S-6



HEAD (5)

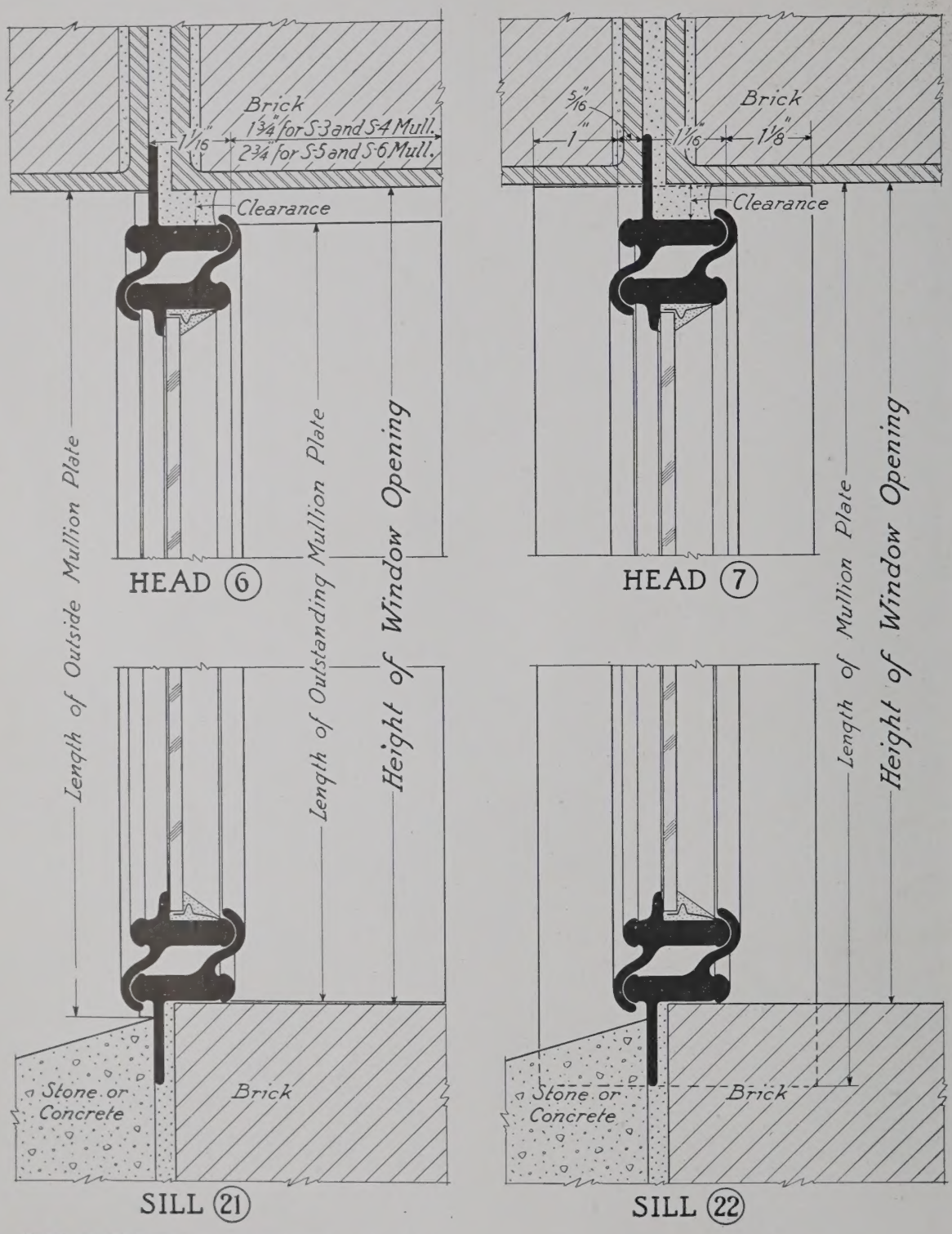


SILL (20)

Detail with Type "A" Mullion

Details of Typical Connections with Concrete Sills and Lintels

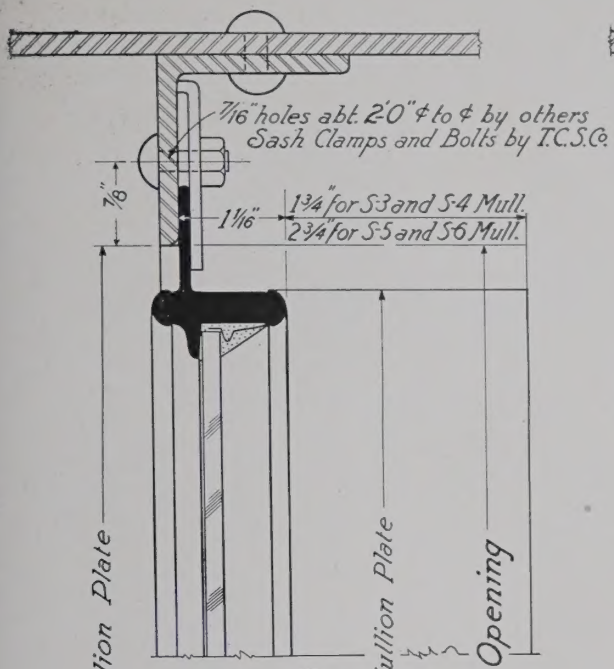
One-half Size



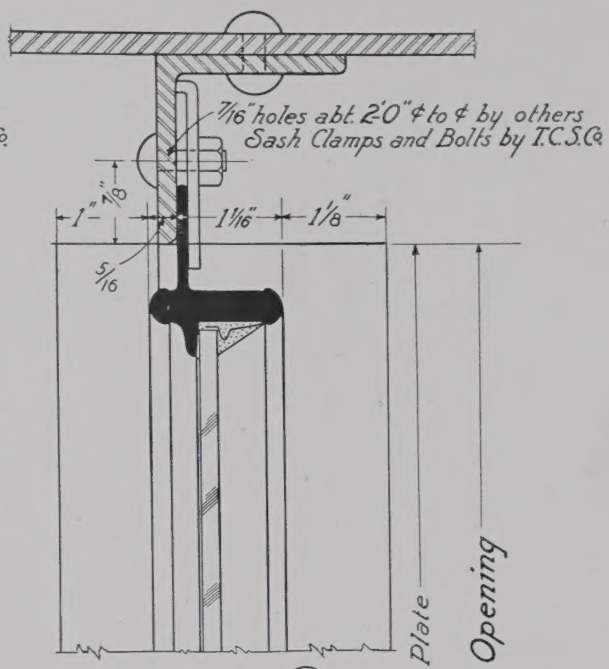
Detail with Mullions Type S-1, S-2, S-3, S-4, S-5 and S-6

Detail with Type "A" Mullion

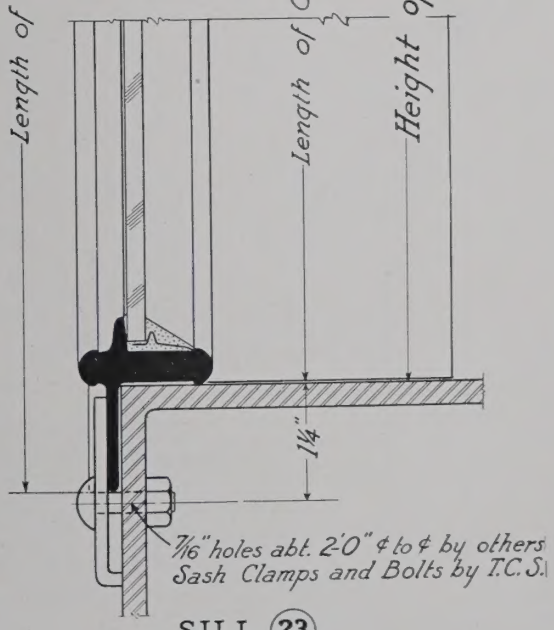
Details of Typical Connections with Steel Lintel and Masonry Sill


7/16" holes abt. 2'0" ¢ to ¢ by others
Sash Clamps and Bolts by T.C.S.Co.
7/8"
1 1/16"
1 3/4" for S-3 and S-4 Mull.
2 3/4" for S-5 and S-6 Mull.
Length of Outside Mullion Plate
Length of Outstanding Mullion Plate
Height of Window Opening

HEAD (8)

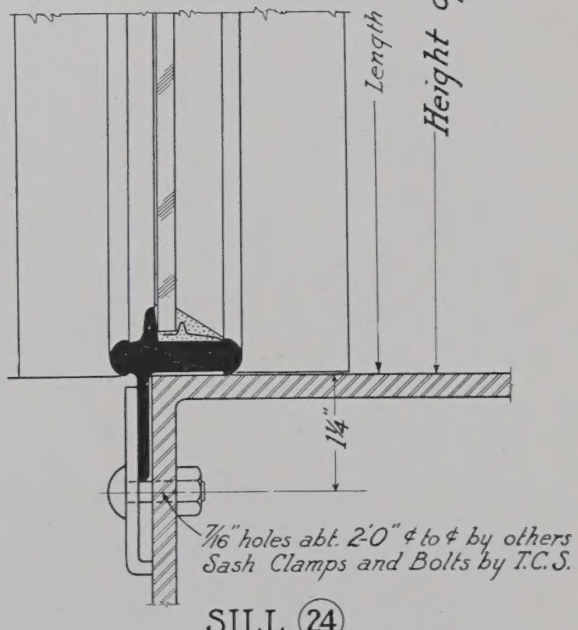


HEAD (9)



SILL (23)

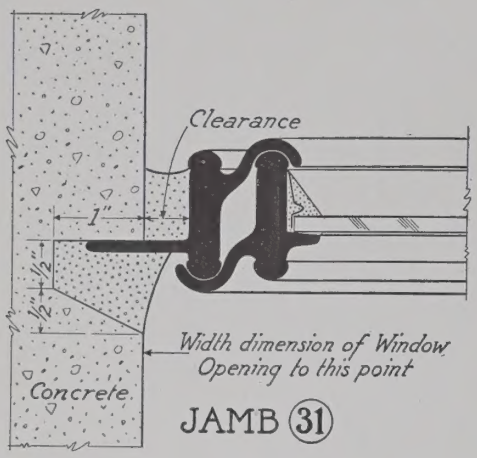
Detail with Mullions Type S-1, S-2, S-3, S-4, S-5 and S-6



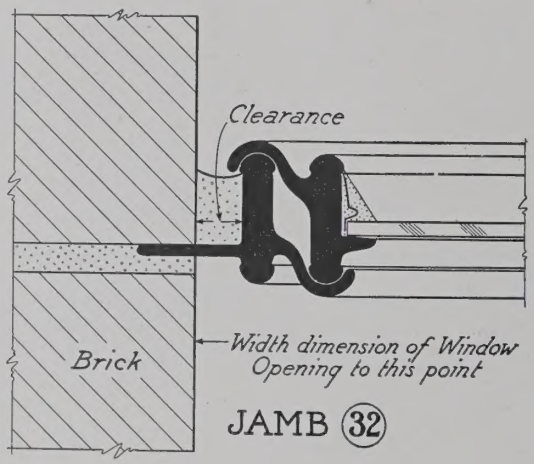
SILL (24)

Detail with Type "A" Mullion

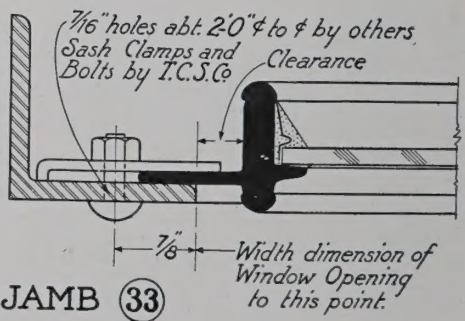
Details of Typical Connections with Structural Steel Frame



JAMB (31)



JAMB (32)

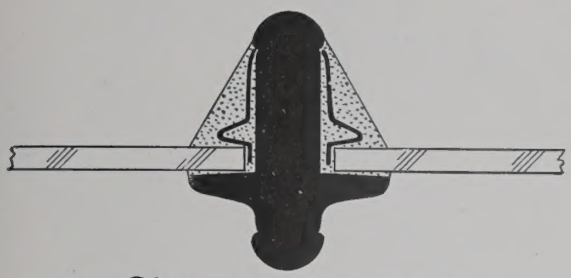


JAMB (33)

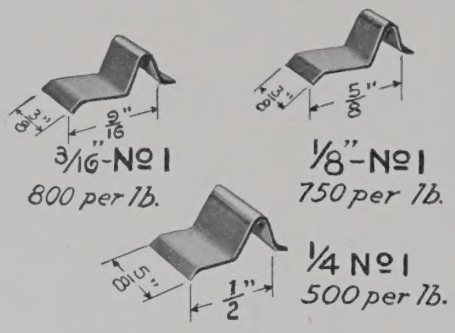
Details of Typical Connections With Concrete, Brick and Structural Steel Jambs

One-half Size

Glazing Semi-Stock Sash



SINGLE GLAZING
(With Glazing Clips)



Semi-stock sash are glazed from the inside only.

The special spring clips for glazing are readily set in place by means of an ordinary putty knife as illustrated. These clips firmly press the glass against the putty and at the same time have enough elasticity to take up the variations in the glass and to absorb the shock of vibration. If desired, special glazing pliers for installing clips can be supplied.

The continuous ledge, extending the entire length of the steel section, prevents the putty from working loose or cracking away. The sash sections are so designed that a saving of over 50% is made in the amount of putty required. This fact, together with the use of Spring Clips, makes the cost of glazing United Steel Sash very low.

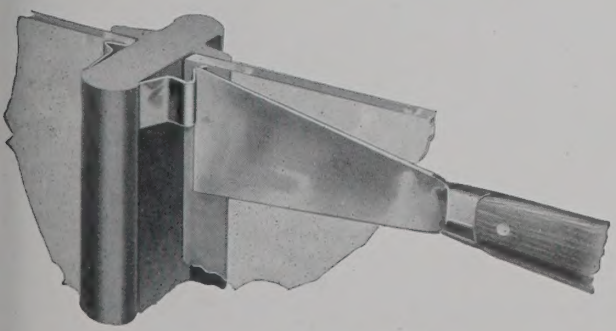
The glass bears evenly on its four edges against a continuous one-piece steel section extending completely around the light. There can be no movement at the joint to cause breakage of glass and loosening of putty. Spring Clips of proper size for any thickness glass are furnished free with each order of United Steel Sash.

The top and bottom rows of glass in the ventilators are 7/8" shorter and the glass along the sides of the ventilators is 7/8" narrower than the glass in the remainder of the sash. This should be noted in ordering glass.

United Steel Sash Putty

United Steel Sash Putty represents the result of extensive practical tests to determine the best product for metal sash. It glazes easily and smoothly, shows a perfect adhesion for both metal and glass, hardens throughout evenly and uniformly in a comparatively short time to a tough and resistive body, costs no more than any good putty and gives results that are far more efficient and satisfactory.

Spring Clip in Place



Installing Spring Clip with Putty Knife

By Pushing on the Putty Knife, the edge of the Spring Clip moves towards the sash until it springs in place

This hardware is furnished with semi-stock sash ventilators unless A-2 hardware is specified (See opposite page). Note the simplicity of operation and perfect locking device.

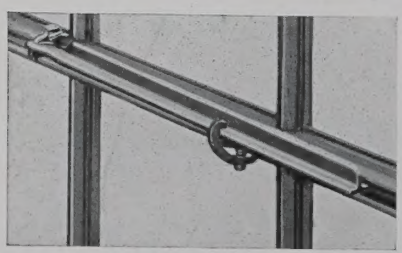
Ventilators may be opened at practically any angle up to 60 degrees, unless the ventilators extend to the sill in which case they can be held open in two positions only, i.e., they can be opened either slightly or to the fullest extent. If desired the sills can be constructed with an extreme pitch on the inside to eliminate the interference of the sill with the proper operation of the bar.

Bars are furnished in stock lengths of 10, 13, 16, 19, 22 and 25 inches depending upon the width of the ventilator. If a special length of bar is required it must be specified when ordering the sash.

All castings are of malleable iron sherardized.

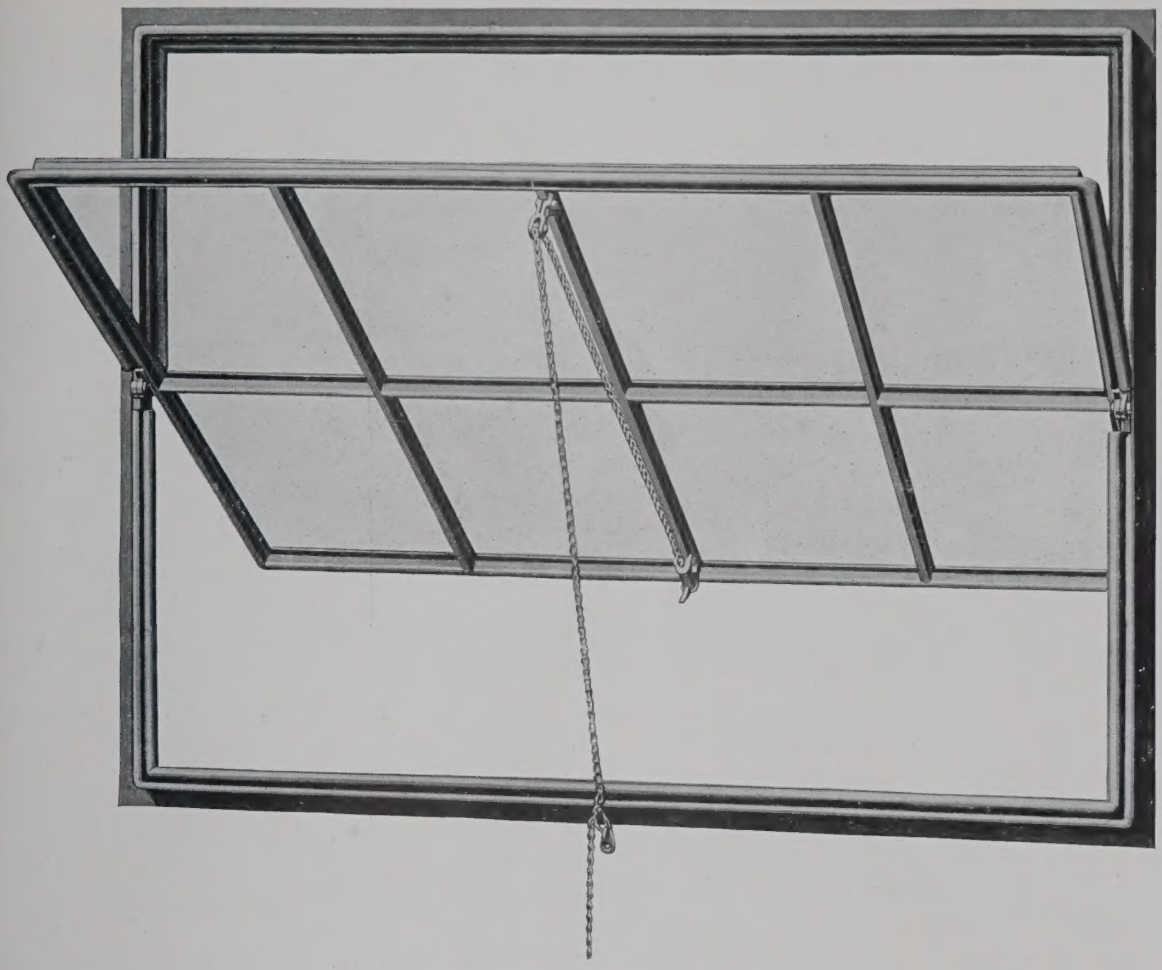
All hardware is attached in the shop.

Ventilator Part Way Open.



Ventilator Closed and Locked.

Set E1 Hardware



Type A2 Hardware

This hardware is furnished with semi-stock sash ventilators when specified. It is carefully boxed and listed and shipped with the sash. It must be attached in the field by the contractor erecting the sash.

Instructions for Ordering Semi-Stock Sash

1st. Name.
Give name of consignee, owner and name or title of building.

2nd. Shipping Directions.
Show clearly the railroad to be shipped over, point of delivery, the date on which shipment is required and complete billing instructions.

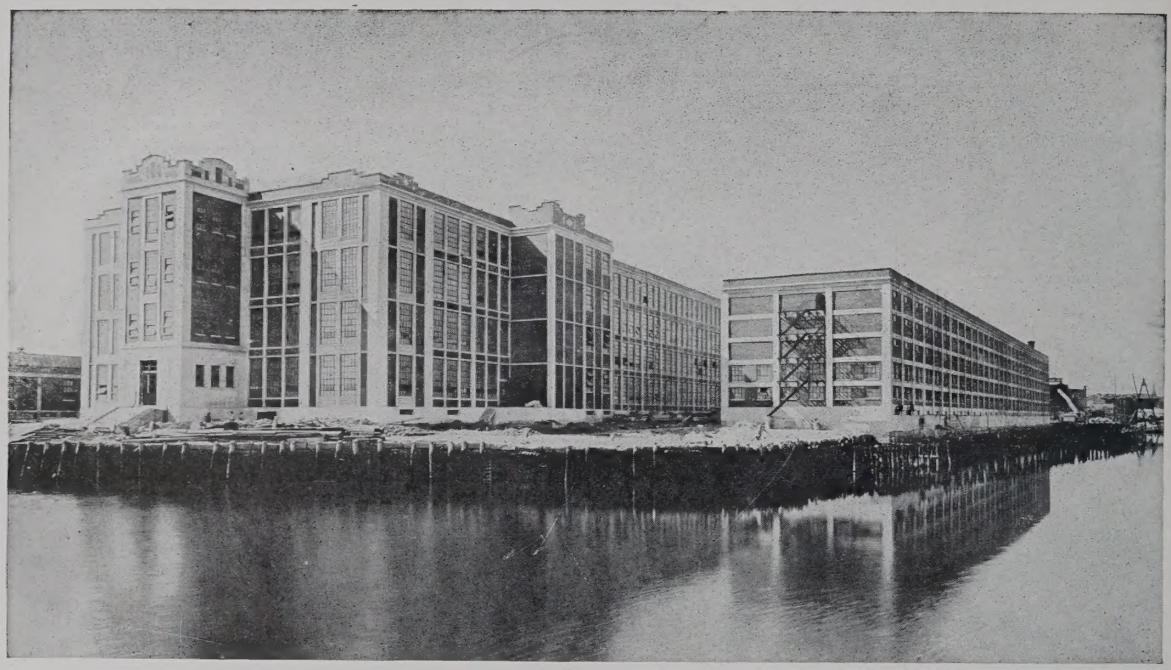
3rd. Type of Sash.
Give the number and type of the sash required.

4th. Mullions.
Give the number, type and length of mullions required, or state clearly which sash are to be combined with mullions.

5th. Details.
Give detail numbers of sills, lintels and jambs. (See pages 45 to 48.)

6th. Glass.
Give thickness of glass so that proper glazing clips may be furnished.

7th. Miscellaneous.
Give number of sash clamps and bolts if required.



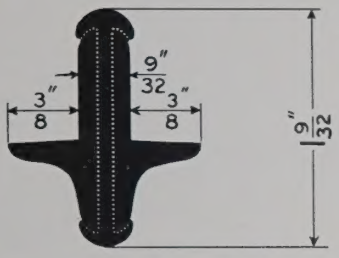
Naumkeag Steam Cotton Co., Salem, Mass. Lockwood, Greene & Co., Engineers
All windows of United Steel Sash.

To-Order Units of Pivoted Sash

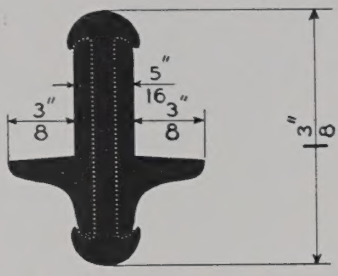
To-order units of United Steel Sash are furnished with pivoted ventilators to meet all practical requirements. These ventilators are pivoted horizontally or vertically and are arranged so as to give any desired amount of ventilation. Ordinarily, we would recommend the use of stock or semi-stock sash wherever possible owing to the saving of time and cost. To-order units are manufactured to meet individual requirements which are not covered by stock or semi-stock sash.

To-order units can be furnished in any size of glass with widths varying from 5″ to 48″, and heights varying from 8″ to 48″. Single units should not be over 7′–4″ in width nor 15′–0″ in height. We are, however, prepared to furnish sash in greater widths than 7′–4″ provided the height is not over 7–′4″. We are prepared to manufacture sash with glass sizes varying by one-half inches in width and single inches in height but we do not recommend these intermediate sizes as the cost of the sash must be materially increased.

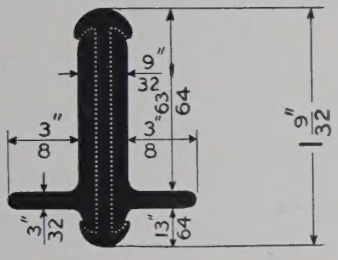
In the following pages are indicated a few of the types of to-order units which we furnish. It would be manifestly impossible to show in limited space the numerous different types and arrangements of sash which we manufacture. We will gladly furnish suggestions as to the most satisfactory method of solving individual problems in sash design. Our large corp of sash specialists are experts on the subject of day-lighting, ventilating and window arrangement and co-operate fully with architects, engineers, owners and contractors.



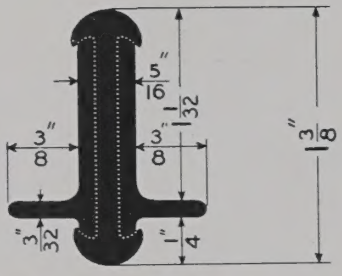
No 101 SECTION



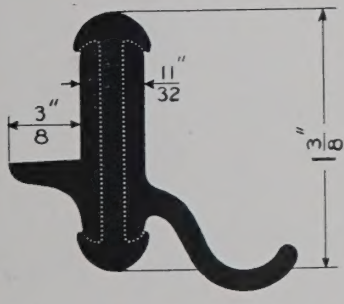
No 121 SECTION



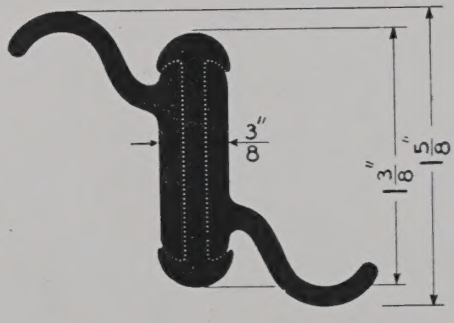
No COC SECTION



No C2C SECTION

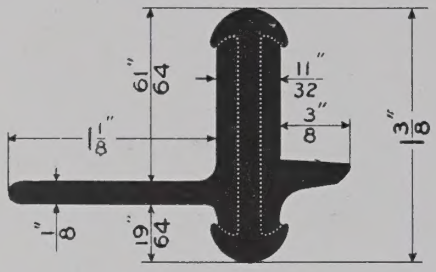


No 125 SECTION

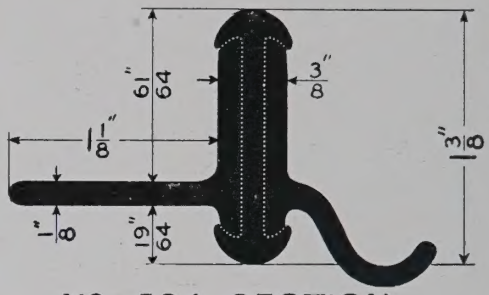


No 525 SECTION

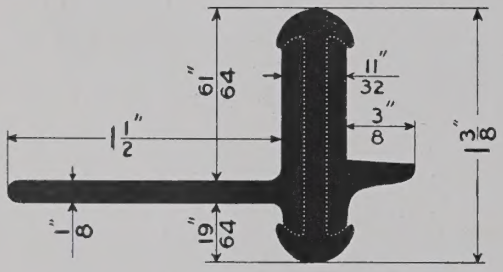
Interior Horizontal and Vertical Muntins of To-Order Sash



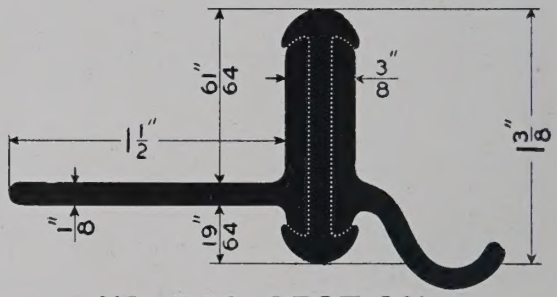
No 124 SECTION
(No 4 Regular)



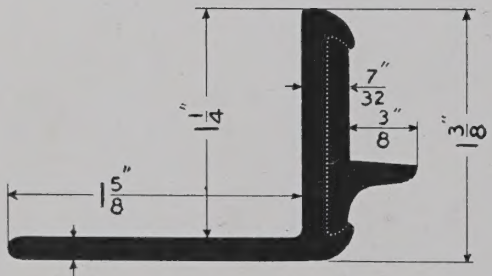
No 524 SECTION
(No 4 Regular)



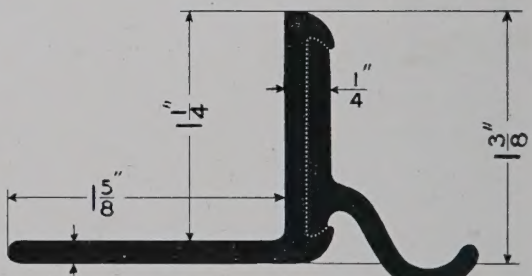
No 128 SECTION
(No 8 Regular)



No 528 SECTION
(No 8 Regular)

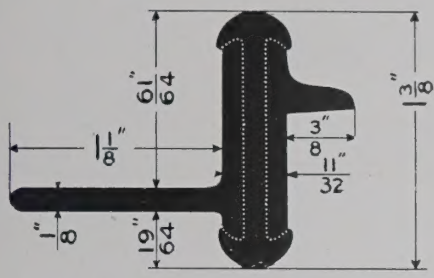


No 1J SECTION
(No J Regular)

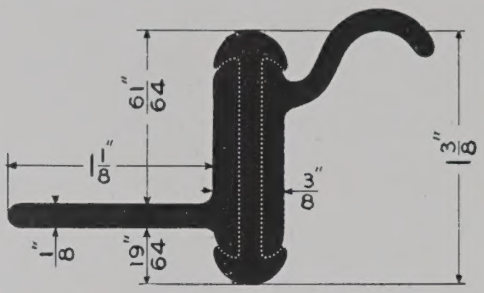


No 1J SECTION
(No J Regular)

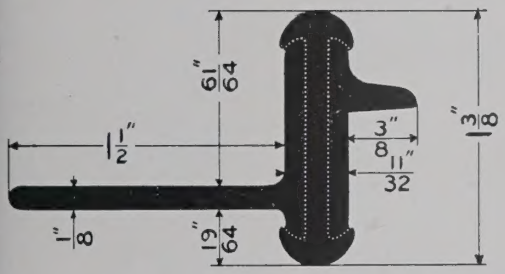
Outside Angle Sections of To-Order Sash



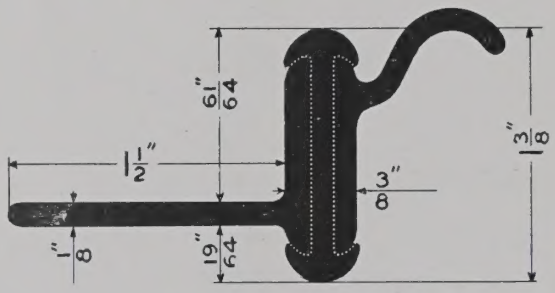
Nº 124 SECTION
(Nº 4 Reversed)



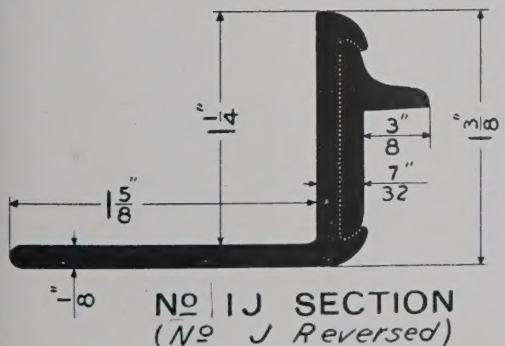
Nº 524 SECTION
(Nº 4 Reversed)



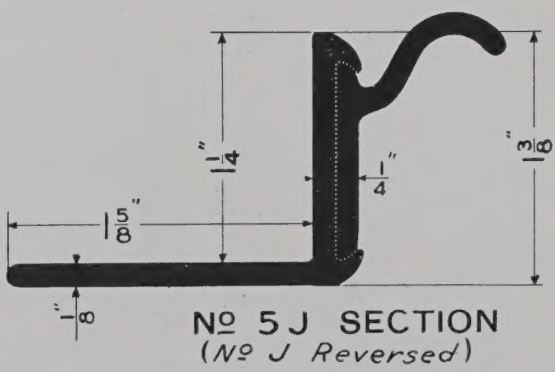
Nº 128 SECTION
(Nº 8 Reversed)



Nº 528 SECTION
(Nº 8 Reversed)

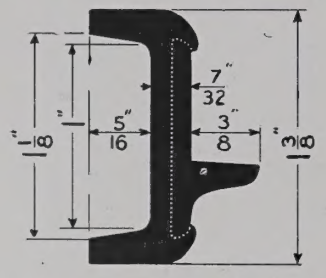


Nº 1J SECTION
(Nº J Reversed)

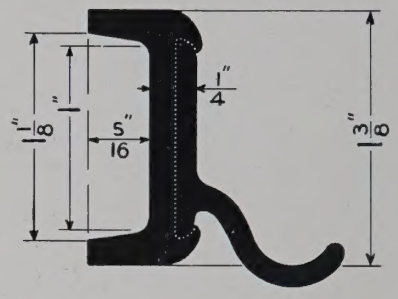


Nº 5J SECTION
(Nº J Reversed)

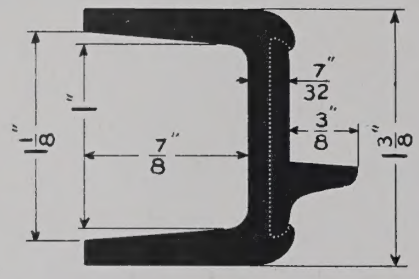
Outside Angle Sections of To-Order Sash



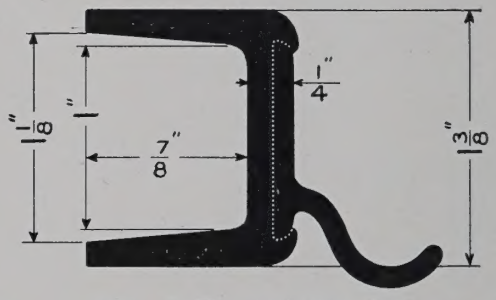
№ 13 SECTION



№ 53 SECTION

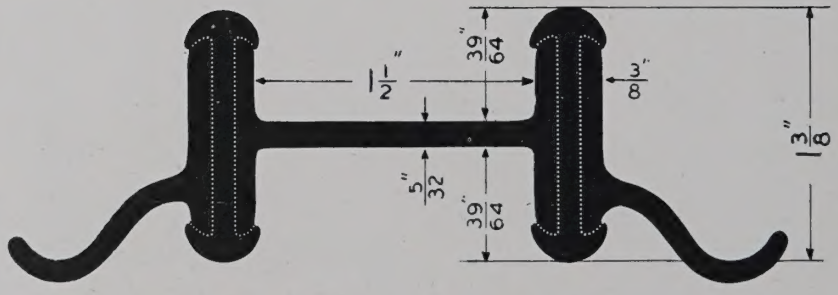


№ 1 D SECTION



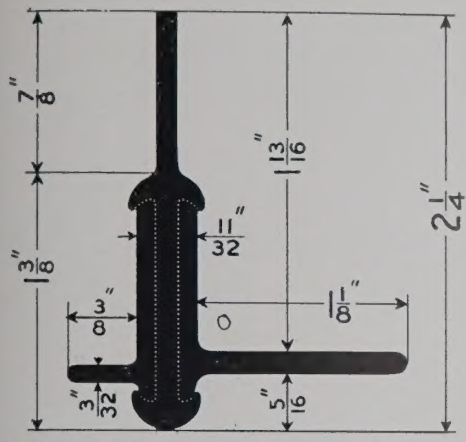
№ 5 D SECTION

Outside Channel Sections of To-Order Sash

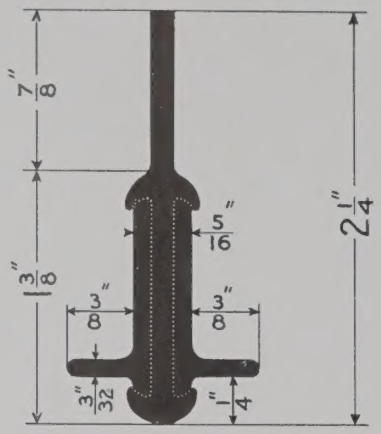


№ 52 F 25 SECTION

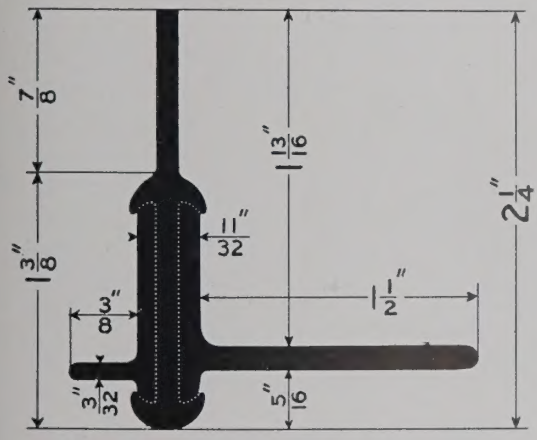
Double Ventilator Section for Vertically Pivoted Sash



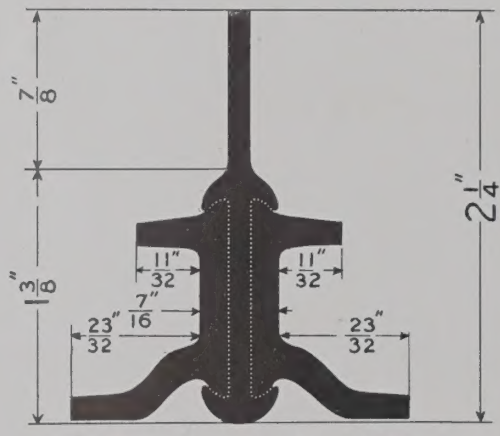
No C-9-4 SECTION
(No 4 Regular)



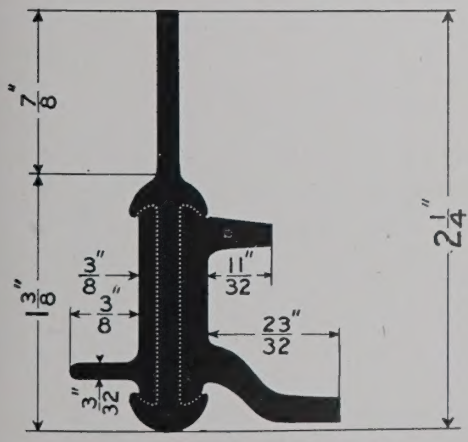
No C-9-C SECTION



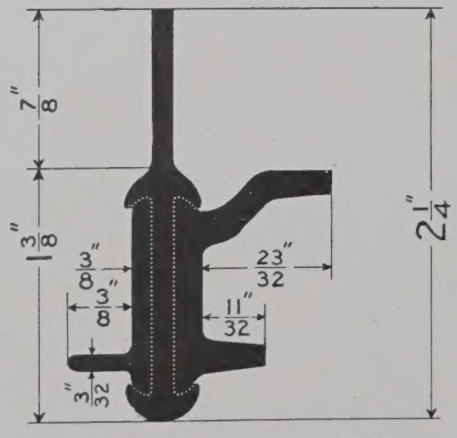
No C-9-8 SECTION
(No 8 Regular)



No L-9-L SECTION

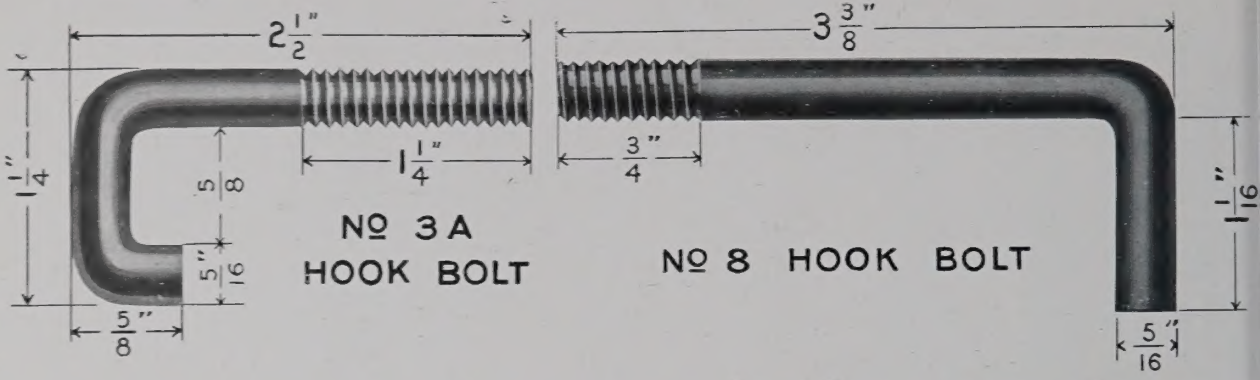


No C-9-L SECTION



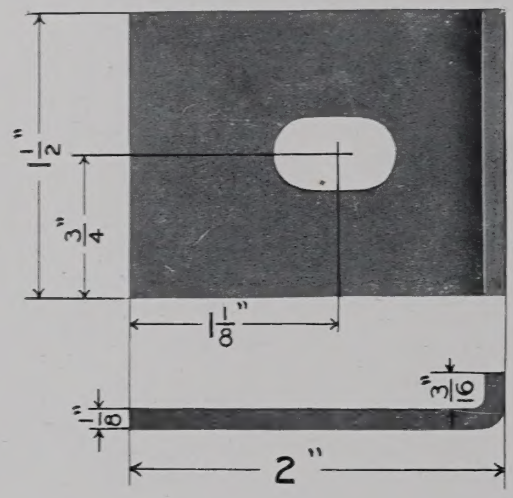
No C-9-L SECTION

Special Sections of To-Order Sash

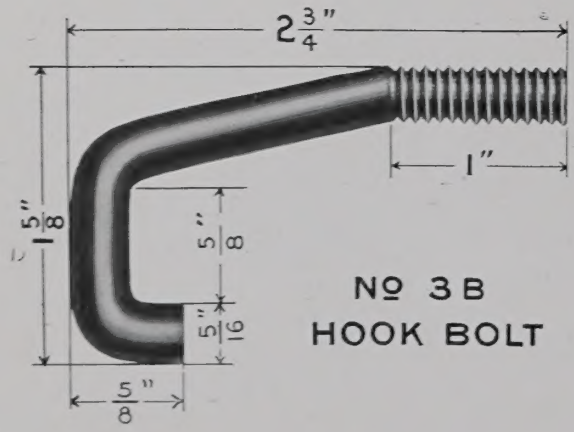


Nº 3A HOOK BOLT

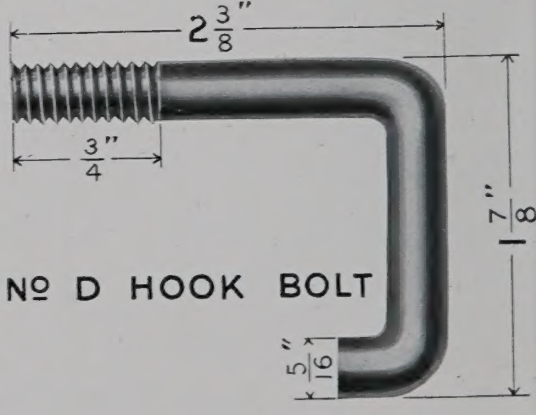
Nº 8 HOOK BOLT



STANDARD SASH CLAMP



Nº 3B HOOK BOLT



Nº D HOOK BOLT

Ford Service Building, Cleveland, Ohio. Daylighted with United Steel Sash.

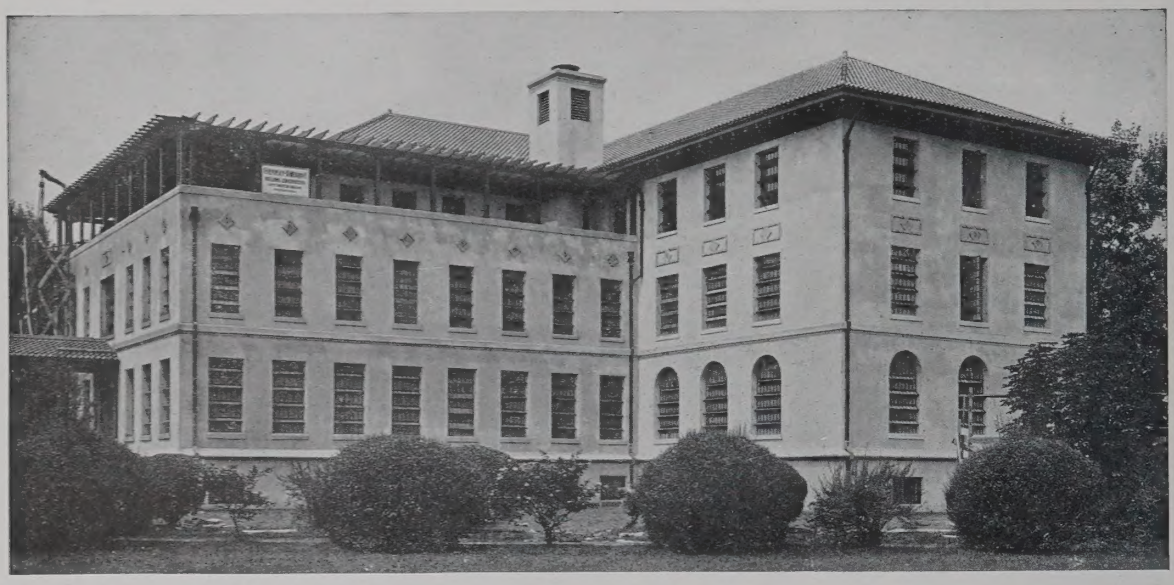
To-Order Sash With Horizontally Pivoted Ventilators

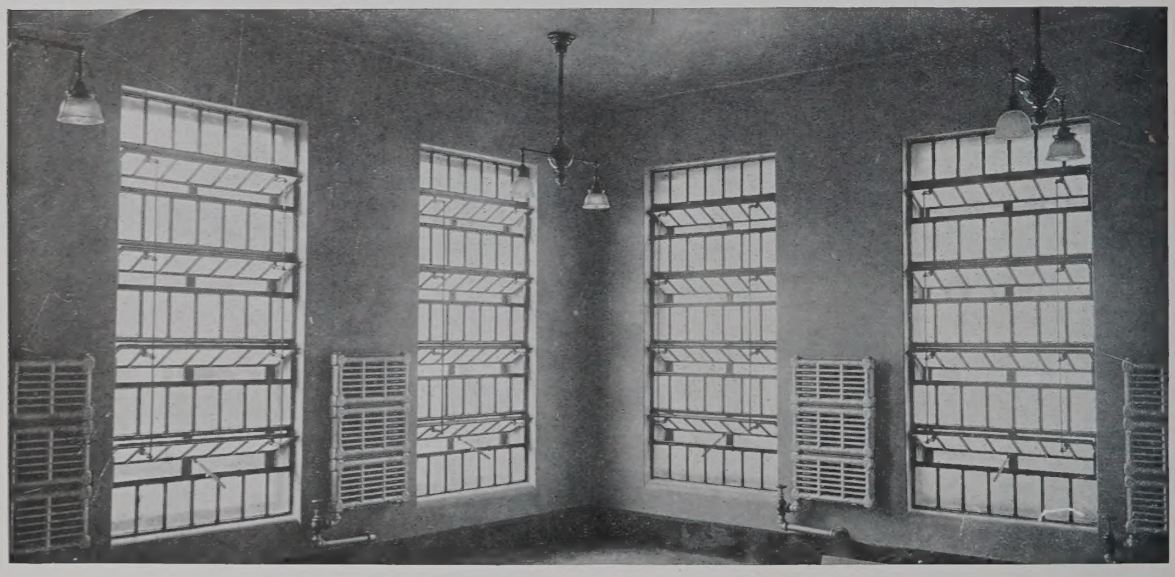
Sash with horizontally pivoted ventilators are, perhaps, the most popular of all types of steel sash. They are used extensively in buildings of all types; the centrally pivoted type in factories, warehouses, garages and industrial buildings and the Economy Casement type in offices, schools and public buildings. The design, material and workmanship are of exactly the same high class as described in detail on pages 3 to 15.

In the centrally pivoted types the ventilators are pivoted slightly above the center so as to permit easy operation, maximum ventilation and automatic closing. The Economy Casement types are illustrated and described on pages 62 and 63.

Horizontally pivoted ventilators may be located at any part of the sash and one or more used in each unit. Practically any desired amount or arrangement of ventilation may be secured. Each ventilator should not exceed 5′–0″ in width and 4′–6″ in height.

The hardware for horizontally pivoted ventilator sash is illustrated on pages 78 to 84. Ordinarily the push bar hardware is used for sash within easy reach while the spring latch hardware is used on ventilators which are not readily accessible. Mechanical operators can also be provided for operating any desired number of ventilators from a central station.



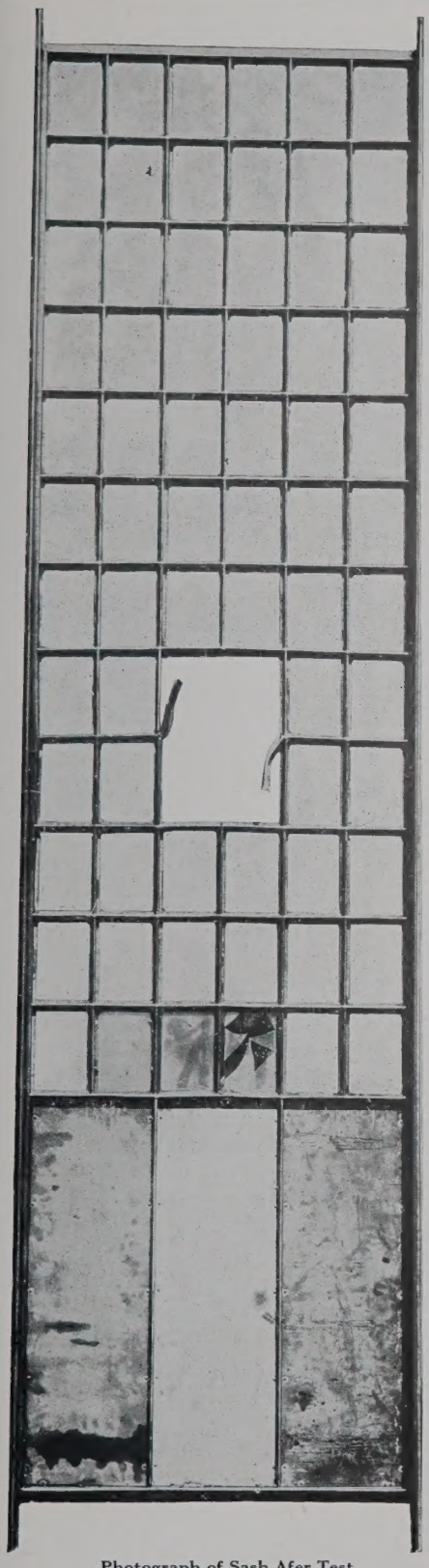


Detention Building, Immigration Station, Gloucester, N. J.

Special Horizontally Pivoted Sash for Prisons, Asylums, Etc.

This sash is the same in construction as described on pages 3 to 15. The illustration on this page shows the sash with lights 6″ x 9″ so that the muntins prevent the escape of inmates. The ventilators are one light high and are operated together by means of push bars and connecting rods.

The great strength and rigidity of United Steel Sash makes them particularly adapted to buildings of this type as is proven by the remarkable test described and illustrated on page 61.



Photograph of Sash Afer Test

Remarkable Test of United Steel Sash for Detention Homes, Asylums, Jails, Etc.

To determine the strength necessary to break through United Steel Sash, a condition that might occur in Detention Homes, Prisons, Asylums, etc., a most interesting test was recently conducted at Youngstown, Ohio, under the supervision of the State Architect of New Jersey.

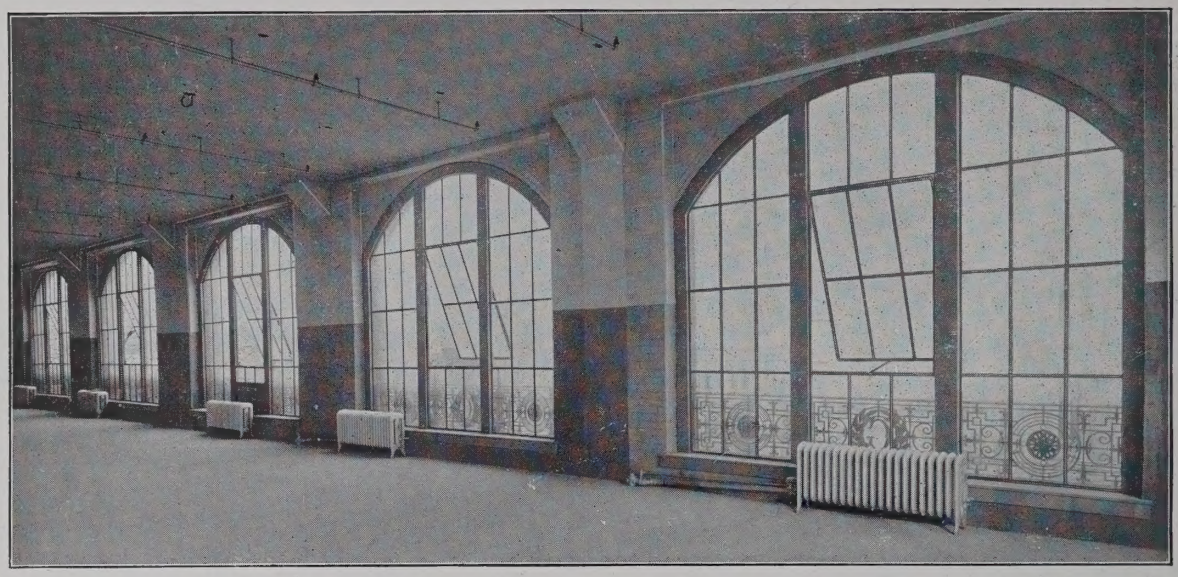
The sash tested was 3′ by 12′ in size, divided into 5″ x 8″ lights. The sash was placed horizontally and supported at both ends and at the center of the sides. After first loading one of the joints to 1814 pounds, without weakening the sash, this load was removed.

The four muntins framing into the joint were then cut with a hack saw to the plane of the glass. Under this condition the load was again applied until a total of 2640 pounds was reached. The only sign of weakness was a slight crack on the tension side, but no muntin was broken through.

The object of the test was to break through the sash. As the great weight did not accomplish this result, a crowbar was next tried but without success. Finally after 31 powerful blows with a 12-pound sledge, it was possible to break through the longitudinal muntin and allow the cross bars to be bent back.

Even after this treatment there was only a small opening 10″ x 16″ in the sash, an opening with sharp cutting edges of broken off sections that would seriously hinder passage through the sash. The photograph shows condition of the sash after the end of the test.

Probably no sash has ever been subjected to such a severe test and withstood it so perfectly.

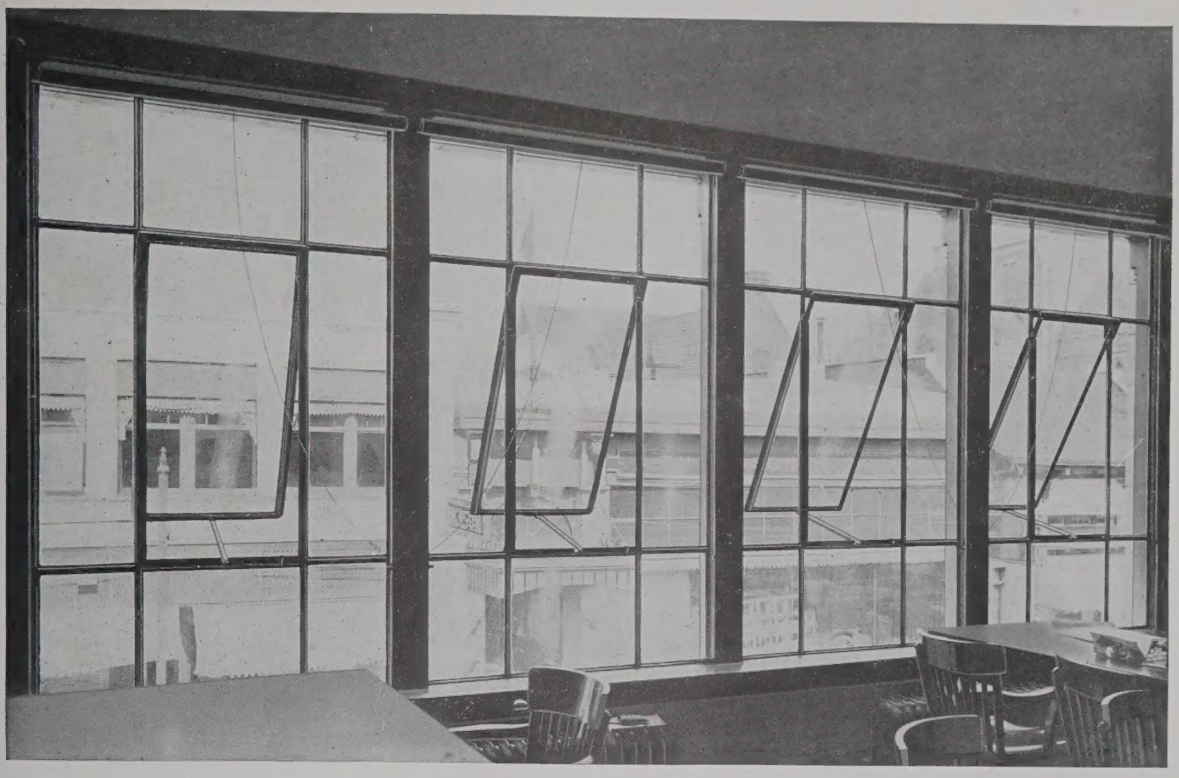


B. F. Goodrich Building, Detroit, Mich.
Economy Casements of United Steel Sash—Kahn System Reinforced Concrete

Albert Kahn, Architect
Ernest Wilby, Associate

Service Building Ford Motor Co., Detroit, Mich.
All Windows above second story are Economy Casements of United Steel Sash.
Kahn System Reinforced Concrete.

Albert Kahn, Architect
Ernest Wilby, Associate



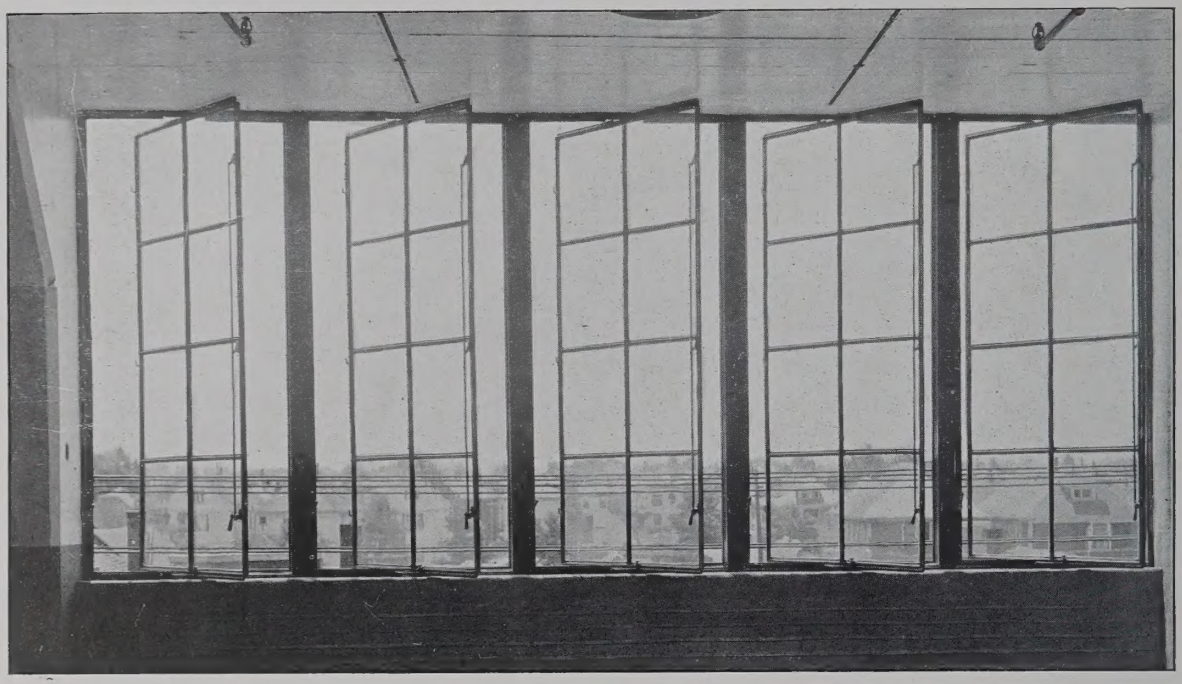
Typical Bay of United Steel Economy Casements in Flanders Building, Detroit, Mich.

Economy Casements of United Steel Sash

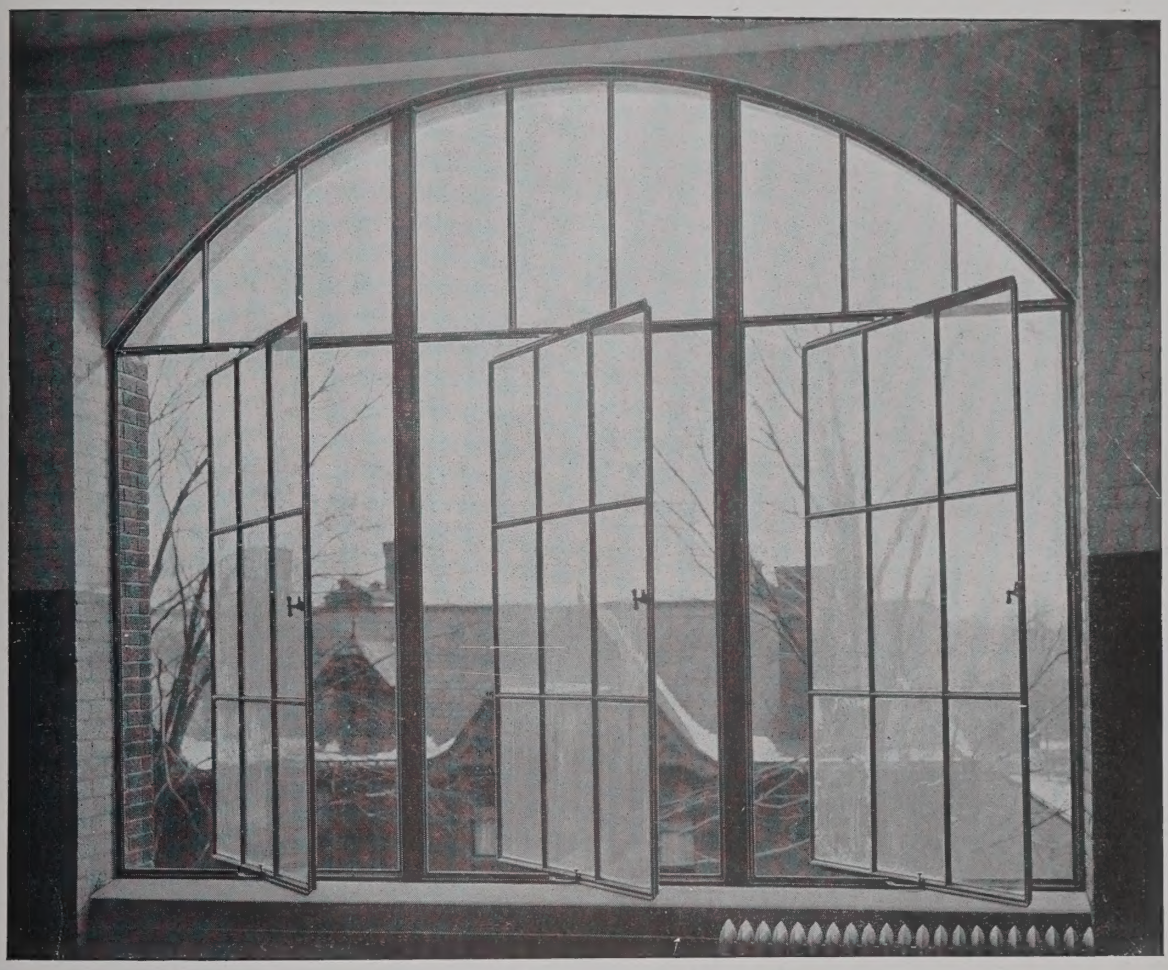
These solid steel sash meet in every way the exacting requirements of the better class of commercial buildings, such as stores and offices, as well as schools and other public buildings. The artistic design and arrangement of the lights add to the architectural beauty.

The operating ventilators can be opened to admit any amount of fresh air and are located high up so as to prevent drafts. Shades and curtains can be located where desired, as the ventilators are pivoted near the top and do not project into the interior. Drafts and storms are effectively shut out by circular, double-contact weathering and secure locking devices. Maximum daylight is assured, as no window space is required around the sash for weight boxes. With all of these advantages this type of sash is much less expensive than other metal casements.

Economy Casements are made in all sizes and arrangement of lights to meet all requirements. The sash may be made practically any number of lights in width and height. Ventilators with single lights must not be more than 4′ in width or height, and with multiple lights not over 5′ wide or 4′–6″ high. Single unit sash should not be more than 7′–4″ wide or 12′ high. The sizes of lights may vary by inches from 10″ to 48″ in width and from 16″ to 48″ in height.



Vertically Pivoted United Steel Sash in this building of the Ford Motor Co., assure 100 per cent ventilation and maximum daylight.



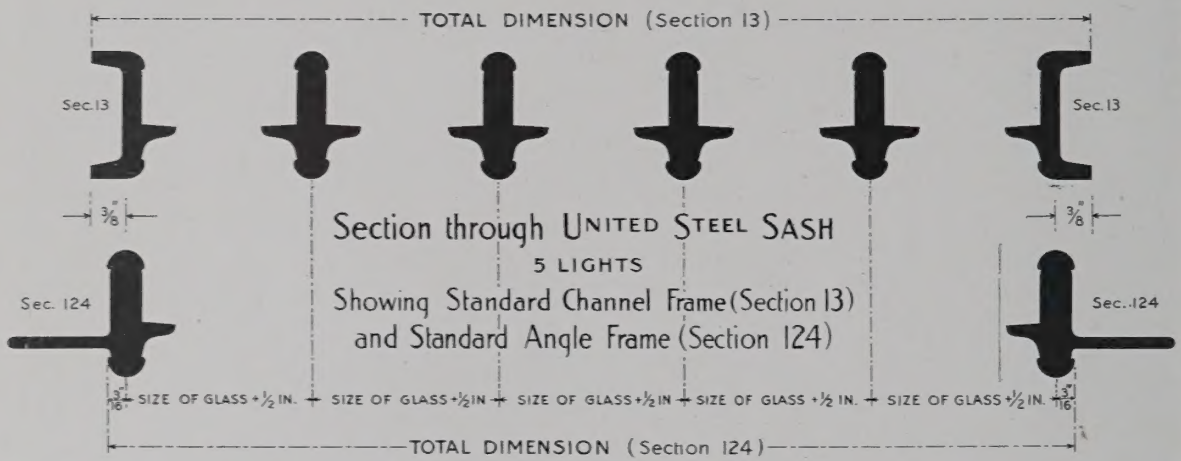
B. F. Goodrich Co. Bldg., Detroit, Mich.

Albert Kahn, Architect,
Ernest Wilby, Associate

Vertically Pivoted United Steel Sash

The construction of this sash is similar to our horizontally pivoted sash, possessing all their distinct advantages, including the double circular surface weathering. The superior strength of United Steel Sash permits the use of exceptionally large ventilators allowing 100% ventilation if desired. Vertically pivoted sash permits easy cleaning of the glass. The ventilators which swing through an arc of 160 degrees can be set at any angle to properly deflect air currents into the building. At the lower pivot the sash has a metal semi-circular adjuster which holds the ventilator fixed at any angle. The ventilator is securely locked by heavy latches with substantial handles. All hardware is specially manufactured in our own shops. Ventilators should not exceed 3′–6″ in width, nor 7′–0″ in height.

Method of Computing Sash Width or Height from Glass Size



The following formula shows how the width or height of any sash unit may be obtained from the glass size:

W = n (s + 1/2") + 3/4" (for sash with No. 13 outside section).
W = n (s + 1/2") + 3/8" (for sash with No. 124 outside section).
Where n = number of lights.
s = size of light.
W = total width or height of unit.

To compute the widths of window openings add together the widths of units as figured above, plus the clear mullion distances as shown in table of Mullion distances on page 71, plus clearances at the jambs. This clearance may vary from 1/16" to 5/8" at each jamb.

To compute the heights of window openings add to the height of unit as figured above, clearance at the head of 5/8".

For tables of window openings showing all practical combinations of units with glass sizes varying from 10" to 16" in width and 16" to 24" in height see pages 67 to 69.

Widths of Window Openings for To-Order Sash with Type A or B Mullions

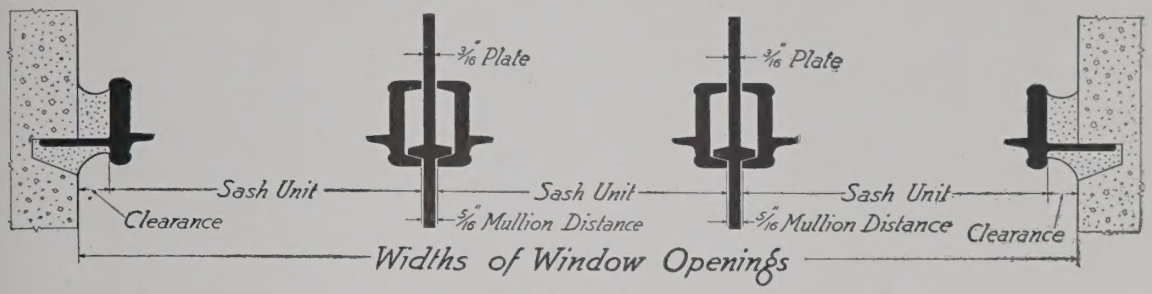


TABLE NO. 6

WIDTH OF GLASS							Total No. of Lights Wide	No. of Units	Number of Lights Wide				Mul. Distance	Clearance at Each Jamb
10"	11"	12"	13"	14"	15"	16"			1st Unit	2nd Unit	3rd Unit	4th Unit		
1'-0"	1'-1"	1'-2"	1'-3"	1'-4"	1'-5"	1'-6"	1	1	1	....	....	....	....	9/16"
1'-10½"	2'-0½"	2'-2½"	2'-4½"	2'-6½"	2'-8½"	2'-10½"	2	1	2	....	....	....	....	9/16"
2'-9"	3'-0"	3'-3"	3'-6"	3'-9"	4'-0"	4'-3"	3	1	3	....	....	....	....	9/16"
3'-7½"	3'-11½"	4'-3½"	4'-7½"	4'-11½"	5'-3½"	5'-7½"	4	1	4	....	....	....	....	9/16"
4'-6"	4'-11"	5'-4"	5'-9"	6'-2"	6'-7"	7'-0"	5	1	5	....	....	....	....	9/16"
5'-4½"	5'-10½"	6'-4½"	6'-10½"	7'-4½"	.....	.....	6	1	6	....	....	....	....	9/16"
5'-5½"	5'-11½"	6'-5½"	6'-11½"	7'-5½"	7'-11½"	8'-5½"	6	2	3	3	....	....	5/16"	½"
6'-3"	6'-10"	7'-5"	.....	.....	.....	.....	7	1	7	....	....	....	....	9/16"
7'-2½"	7'-10½"	8'-6½"	9'-2½"	9'-10½"	10'-6½"	11'-2½"	8	2	4	4	....	....	5/16"	½"
8'-2"	8'-11"	9'-8"	10'-5"	11'-2"	11'-11"	12'-8"	9	3	3	3	3	....	5/16"	½"
8'-11½"	9'-9½"	10'-7½"	11'-5½"	12'-3½"	13'-1½"	13'-11½"	10	2	5	5	....	....	5/16"	½"
9'-0½"	9'-10½"	10'-8½"	11'-6½"	12'-4½"	13'-0½"	14'-0½"	10	3	3	4	3	....	5/16"	½"
9'-11"	10'-10"	11'-9"	12'-8"	13'-7"	14'-6"	15'-5"	11	3	3	5	3	....	5/16"	½"
10'-8½"	11'-8½"	12'-8½"	13'-8½"	14'-8½"	.....	.....	12	2	6	6	....	....	5/16"	½"
10'-9½"	11'-9½"	12'-9½"	13'-9½"	14'-9½"	15'-9½"	16'-9½"	12	3	4	4	4	....	5/16"	½"
10'-10½"	11'-10½"	12'-10½"	13'-10½"	14'-10½"	15'-10½"	16'-10½"	12	4	3	3	3	3	5/16"	7/16"
11'-8'	12'-9"	13'-10"	14'-11"	16'-0"	17'-1"	18'-2"	13	3	4	5	4	....	5/16"	½"
12'-5½"	13'-7½"	14'-9½"	.....	.....	.....	.....	14	2	7	7	....	....	5/16"	½"
12'-6½"	13'-8½"	14'-10½"	16'-0½"	17'-2½"	.....	.....	14	3	4	6	4	....	5/16"	½"
12'-7½"	13'-9½"	14'-11½"	16'-1½"	17'-3½"	18'-5½"	19'-7½"	14	4	3	4	4	3	5/16"	7/16"
13'-5"	14'-8"	15'-11"	17'-2"	18'-5"	19'-8"	20'-11"	15	3	5	5	5	....	5/16"	½"
14'-3½"	15'-7½"	16'-11½"	18'-3½"	19'-7½"	.....	.....	16	3	5	6	5	....	5/16"	½"
14'-4½"	15'-8½"	17'-0½"	18'-4½"	19'-8½"	21'-0½"	22'-4½"	16	4	4	4	4	4	5/16"	7/16"
15'-2"	16'-7"	18'-0"	19'-5"	20'-10"	.....	.....	17	3	6	5	6	....	5/16"	½"
16'-0½"	17'-6½"	19'-0½"	20'-6½"	22'-0½"	.....	.....	18	3	6	6	6	....	5/16"	½"
16'-1½"	17'-7½"	19'-1½"	20'-7½"	22'-1½"	23'-7½"	25'-1½"	18	4	4	5	5	4	5/16"	7/16"
17'-10½"	19'-6½"	21'-2½"	22'-10½"	24'-6½"	26'-2½"	27'-10½"	20	4	5	5	5	5	5/16"	7/16"
19'-7½"	21'-5½"	23'-3½"	25'-1½"	26'-11½"	.....	.....	22	4	5	6	6	5	5/16"	7/16"
20'-4"	22'-1"	23'-10"	.....	.....	.....	.....	21	3	7	7	7	....	5/16"	½"
21'-4½"	23'-4½"	25'-4½"	27'-4½"	29'-4½"	.....	.....	24	4	6	6	6	6	5/16"	7/16"
24'-10½"	27'-2½"	29'-6½"	.....	.....	.....	.....	28	4	7	7	7	7	5/16"	7/16"

See page 69 for table of heights.

Note—Figures in black face type cover semi-stock widths of glass with limitations shown on pages 26 to 29.

Widths of Window Openings for To-Order Sash with Expandable Mullions

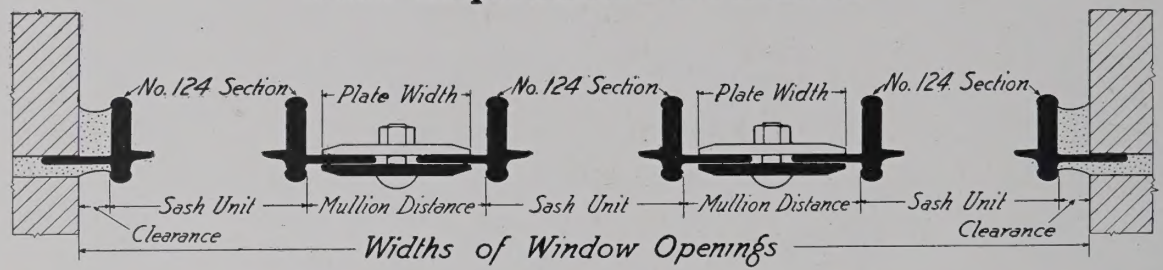


TABLE NO. 7

WIDTH OF GLASS							Total No. of Lights Wide	No. of Units	Number of Lights Wide				Mul. Distance	Width of Mull. Plate	Clearance at Each
10″	11″	12″	13″	14″	15″	16″			1st Unit	2nd Unit	3rd Unit	4th Unit			
1′-0″	1′-1″	1′-2″	1′-3″	1′-4″	1′-5″	1′-6″	1	1	1	....	....	....	....	....	9/16″
1′-10½″	2′-0½″	2′-2½″	2′-4½″	2′-6½″	2′-8½″	2′-10½″	2	1	2	....	....	....	....	....	9/16″
2′-9″	3′-0″	3′-3″	3′-6″	3′-9″	4′-0″	4′-3″	3	1	3	....	....	....	....	....	9/16″
3′-7½″	3′-11½″	4′-3½″	4′-7½″	4′-11½″	5′-3½″	5′-7½″	4	1	4	....	....	....	....	....	9/16″
4′-6″	4′-11″	5′-4″	5′-9″	6′-2″	6′-7″	7′-0″	5	1	5	....	....	....	....	....	9/16″
5′-4½″	5′-10½″	6′-4½″	6′-10½″	7′-4½″	.....	.....	6	1	6	....	....	....	....	....	9/16″
5′-8″	6′-2″	6′-8″	7′-2″	7′-8″	8′-2″	8′-8″	6	2	3	3	....	....	3″	2½″	5/8″
5′-9″	6′-3″	6′-9″	7′-3″	7′-9″	8′-3″	8′-9″	6	2	3	3	....	....	4″	3″	5/8″
7′-5″	8′-1″	8′-9″	9′-5″	10′-1″	10′-9″	11′-5″	8	2	4	4	....	....	3″	2½″	5/8″
7′-6″	8′-2″	8′-10″	9′-6″	10′-2″	10′-10″	11′-6″	8	2	4	4	....	....	4″	3″	5/8″
8′-6½″	9′-3½″	10′-0½″	10′-9½″	11′-6½″	12′-3½″	13′-0½″	9	3	3	3	3	....	3″	2½″	7/16″
8′-7½″	9′-4½″	10′-1½″	10′-10½″	11′-7½″	12′-4½″	13′-1½″	9	3	3	3	3	....	3½″	3″	7/16″
8′-8½″	9′-5½″	10′-2½″	10′-11½″	11′-8½″	12′-5½″	13′-2½″	9	3	3	3	3	....	4″	3″	7/16″
9′-2″	10′-0″	10′-10″	11′-8″	12′-6″	13′-4″	14′-2″	10	2	5	5	....	....	3″	2½″	5/8″
9′-3″	10′-1″	10′-11′	11′-9″	12′-7″	13′-5″	14′-3	10	2	5	5	....	....	4″	3″	5/8″
9′-5″	10′-3″	11′-1″	11′-11″	12′-9″	13′-7″	14′-5″	10	3	3	4	3	....	3″	2½″	7/16″
9′-6″	10′-4″	11′-2″	12′-0″	12′-10″	13′-8″	14′-6″	10	3	3	4	3	....	3½″	3″	7/16″
9′-7″	10′-5″	11′-3″	12′-1″	12′-11″	13′-9″	14′-7″	10	3	3	4	3	....	4″	3″	7/16″
10′-3½″	11′-2½″	12′-1½″	13′-0½″	13′-11½″	14′-10½″	15′-9½″	11	3	3	5	3	....	3″	2½″	7/16″
10′-4½″	11′-3½″	12′-2½″	13′-1½″	14′-0½″	14′-11½″	15′-10½″	11	3	3	5	3	....	3½″	3″	7/16″
10′-5½″	11′-4½″	12′-3½″	13′-2½″	14′-1½″	15′-0½″	15′-11½″	11	3	3	5	3	....	4″	3″	7/16″
10′-11″	11′-11″	12′-11″	13′-11″	14′-11″	.....	.....	12	2	6	6	....	....	3″	2½″	5/8″
11′-0″	12′-0″	13′-0″	14′-0″	15′-0″	.....	.....	12	2	6	6	....	....	4″	3″	5/8″
11′-2″	12′-2″	13′-2″	14′-2″	15′-2″	16′-2″	17′-2″	12	3	4	4	4	....	3″	2½″	7/16″
11′-3″	12′-3″	13′-3″	14′-3″	15′-3″	16′-3″	17′-3″	12	3	4	4	4	....	3½″	3″	7/16″
11′-4″	12′-4″	13′-4″	14′-4″	15′-4″	16′-4″	17′-4″	12	3	4	4	4	....	4″	3″	7/16″
11′-5½″	12′-5½″	13′-5½″	14′-5½″	15′-5½″	16′-5½″	17′-5½″	12	4	3	3	3	3	3″	2½″	1/2″
11′-7″	12′-7″	13′-7″	14′-7″	15′-7″	16′-7″	17′-7″	12	4	3	3	3	3	3½″	3″	1/2″
11′-8½″	12′-8½″	13′-8½″	14′-8½″	15′-8½″	16′-8½″	17′-8½″	12	4	3	3	3	3	4″	3″	1/2″
12′-0½″	13′-1½″	14′-2½″	15′-3½″	16′-4½″	17′-5½″	18′-6½″	13	3	4	5	4	....	3″	2½″	7/16″
12′-1½″	13′-2½″	14′-3½″	15′-4½″	16′-5½″	17′-6½″	18′-7½″	13	3	4	5	4	....	3½″	3″	7/16″
12′-2½″	13′-3½″	14′-4½″	15′-5½″	16′-6½″	17′-7½″	18′-8½″	13	3	4	5	4	....	4″	3″	7/16″
12′-11″	14′-1″	15′-3″	16′-5″	17′-7″	.....	.....	14	3	4	6	4	....	3″	2½″	7/16″
13′-0″	14′-2″	15′-4″	16′-6″	17′-8″	.....	.....	14	3	4	6	4	....	3½″	3″	7/16″
13′-1″	14′-3″	15′-5″	16′-7″	17′-9″	.....	.....	14	3	4	6	4	....	4″	3″	7/16″
13′-2½″	14′-4½″	15′-6½″	16′-8½″	17′-10½″	19′-0½″	20′-2½″	14	4	3	4	4	3	3″	2½″	1/2″
13′-4″	14′-6″	15′-8″	16′-10″	18′-0″	19′-2″	20′-4″	14	4	3	4	4	3	3½″	3″	1/2″
13′-5½″	14′-7½″	15′-9½″	16′-11½″	18′-1½″	19′-3½″	20′-5½″	14	4	3	4	4	3	4″	3″	1/2″
13′-9½″	15′-0½″	16′-3½″	17′-6½″	18′-9½″	20′-0½″	21′-3½″	15	3	5	5	5	....	3″	2½″	7/16″
13′-10½″	15′-1½″	16′-4½″	17′-7½″	18′-10½″	20′-1½″	21′-4½″	15	3	5	5	5	....	3½″	3″	7/16″
13′-11½″	15′-2½″	16′-5½″	17′-8½″	18′-11½″	20′-2½″	21′-5½″	15	3	5	5	5	....	4″	3″	7/16″
14′-8″	16′-0″	17′-4″	18′-8″	20′-0″	.....	.....	16	3	5	6	5	....	3″	2½″	7/16″
14′-9″	16′-1″	17′-5″	18′-9″	20′-1″	.....	.....	16	3	5	6	5	....	3½″	3″	7/16″
14′-10″	16′-2″	17′-6″	18′-10″	20′-2″	.....	.....	16	3	5	6	5	....	4″	3″	7/16″
14′-11½″	16′-3½″	17′-7½″	18′-11½″	20′-3½″	21′-7½″	22′-11½″	16	4	4	4	4	4	3″	2½″	1/2″
15′-1″	16′-5″	17′-9″	19′-1″	20′-5″	21′-9″	23′-1″	16	4	4	4	4	4	3½″	3″	1/2″

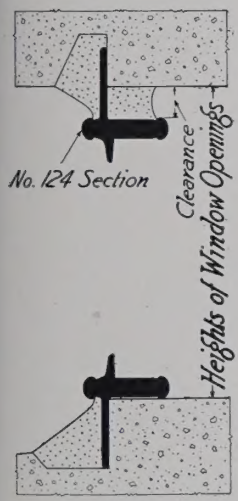
Concluded on next page.

Note—Figures in black face type cover stock and semi-stock widths of glass with limitations shown on pages 16 and 28 to 31.

Widths of Window Openings for To-order Sash with Expandable Mullions

TABLE NO. 7—Concluded

WIDTH OF GLASS							Total No. of Lights Wide	No. of Units	Number of Lights Wide				Mullion Distance	Width of Mull. Plate	Clearance at Each Jamb
10″	11″	12″	13″	14″	15″	16″			1st Unit	2nd Unit	3rd Unit	4th Unit			
15′-2½″	16′-6½″	17′-10½″	19′-2½″	20′-6½″	21′-10½″	23′-2½″	16	4	4	4	4	4	4″	3″	½″
15′-6½″	16′-11½″	18′-4½″	19′-9½″	21′-2½″	.....	.....	17	3	6	5	6	....	3″	2½″	7/16″
15′-7½″	17′-0½″	18′-5½″	19′-10½″	21′-3½″	.....	.....	17	3	6	5	6	....	3½″	3″	7/16″
15′-8½″	17′-1½″	18′-6½″	19′-11½″	21′-4½″	.....	.....	17	3	6	5	6	....	4″	3″	7/16″
16′-5″	17′-11″	19′-5″	20′-11″	22′-5″	.....	.....	18	3	6	6	6	....	3″	2½″	7/16″
16′-6″	18′-0″	19′-6″	21′-0″	22′-6″	.....	.....	18	3	6	6	6	....	3½″	3″	7/16″
16′-7″	18′-1″	19′-7″	21′-1″	22′-7″	.....	.....	18	3	6	6	6	....	4″	3″	7/16″
16′-8½″	18′-2½″	19′-8½″	21′-2½″	22′-8½″	24′-2½″	25′-8½″	18	4	4	5	5	4	3″	2½″	½″
16′-10″	18′-4″	19′-10″	21′-4″	22′-10″	24′-4″	25′-10″	18	4	4	5	5	4	3½″	3″	½″
16′-11½″	18′-5½″	19′-11½″	21′-5½″	22′-11½″	24′-5½″	25′-11½″	18	4	4	5	5	4	4″	3″	½″
18′-5½″	20′-1½″	21′-9½″	23′-5½″	25′-1½″	26′-9½″	28′-5½″	20	4	5	5	5	5	3″	2½″	½″
18′-7″	20′-3″	21′-11″	23′-7″	25′-3″	26′-11″	28′-7″	20	4	5	5	5	5	3½″	3″	½″
18′-8½″	20′-4½″	22′-0½″	23′-8½″	25′-4½″	27′-0½″	28′-8½″	20	4	5	5	5	5	4″	3″	½″
20′-2½″	22′-0½″	23′-10½″	25′-8½″	27′-6½″	.....	.....	22	4	5	6	6	5	3″	2½″	½″
20′-4″	22′-2″	24′-0″	25′-10″	27′-8″	.....	.....	22	4	5	6	6	5	3½″	3″	½″
20′-5½″	22′-3½″	24′-1½″	25′-11½″	27′-9½″	.....	.....	22	4	5	6	6	5	4″	3″	½″
21′-11½″	23′-11½″	25′-11½″	27′-11½″	29′-11½″	.....	.....	24	4	6	6	6	6	3″	2½″	½″
22′-1″	24′-1″	26′-1″	28′-1″	30′-1″	.....	.....	24	4	6	6	6	6	3½″	3″	½″
22′-2½″	24′-2½″	26′-2½″	28′-2½″	30′-2½″	.....	.....	24	4	6	6	6	6	4″	3″	½″

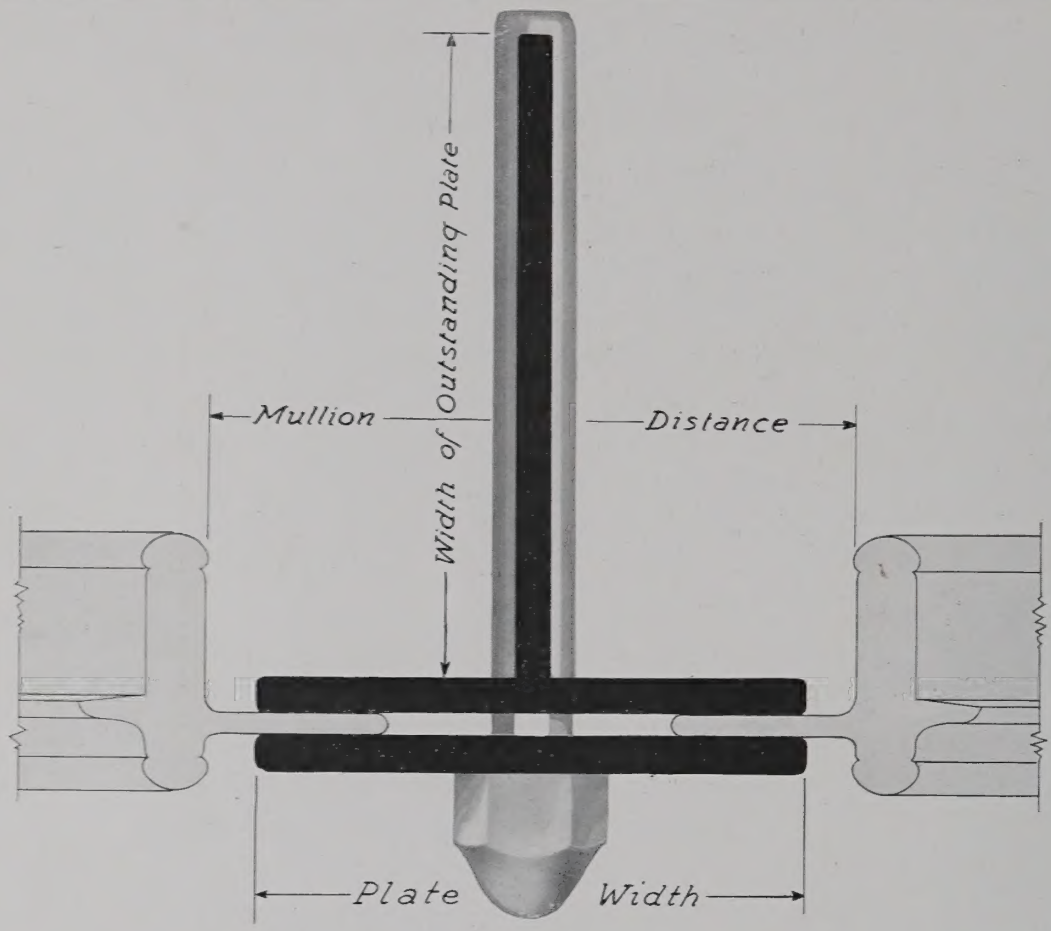


Height of Window Openings

TABLE NO. 8

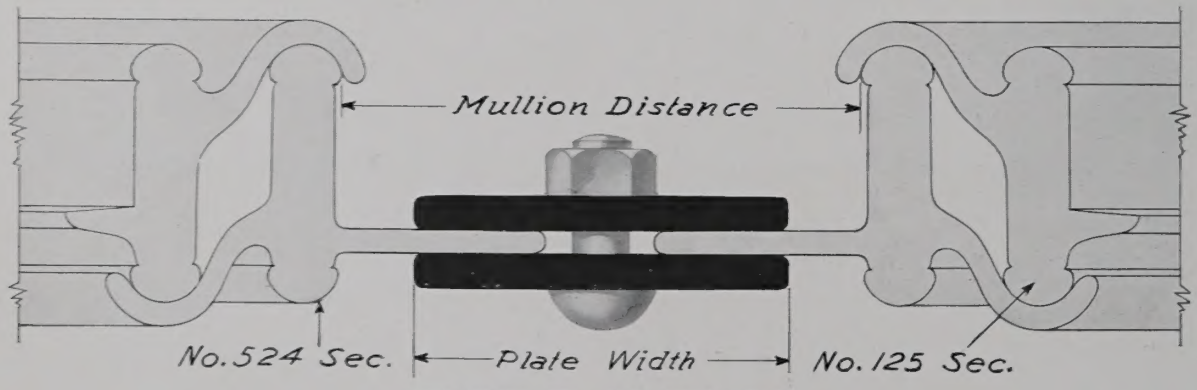
No. of Lights High	HEIGHT OF GLASS								
	16″	17″	18″	19″	20″	21″	22″	23″	24″
1	1′-5½″	1′-6½″	1′-7½″	1′-8½″	1′-9½″	1′-10½″	1′-11½″	2′-0½″	2′-1½″
2	2′-10″	3′-0″	3′-2″	3′-4″	3′-6″	3′-8″	3′-10″	4′-0″	4′-2″
3	4′-2½″	4′-5½″	4′-8½″	4′-11½″	5′-2½″	5′-5½″	5′-8½″	5′-11½″	6′-2½″
4	5′-7″	5′-11″	6′-3″	6′-7″	6′-11″	7′-3″	7′-7″	7′-11″	8′-3″
5	6′-11½″	7′-4½″	7′-9½″	8′-2½″	8′-7½″	9′-0½″	9′-5½″	9′-10½″	10′-3½″
6	8′-4″	8′-10″	9′-4″	9′-10″	10′-4″	10′-10″	11′-4″	11′-10″	12′-4″
7	9′-8½″	10′-3½″	10′-10½″	11′-5½″	12′-0½″	12′-7½″	13′-2½″	13′-9½″	14′-4½″
8	11′-1″	11′-9″	12′-5″	13′-1″	13′-9″	14′-5″	.....	.....	.....
9	12′-5½″	13′-2½″	13′-11½″	14′-8½″	.....	.....	.....	.....	.....
10	13′-10″	14′-8″	.....	.....	.....	.....	.....	.....	.....

Note—Figures in black face type cover stock and semi-stock widths and heights of glass with limitations shown on pages 16 and 28 to 31.



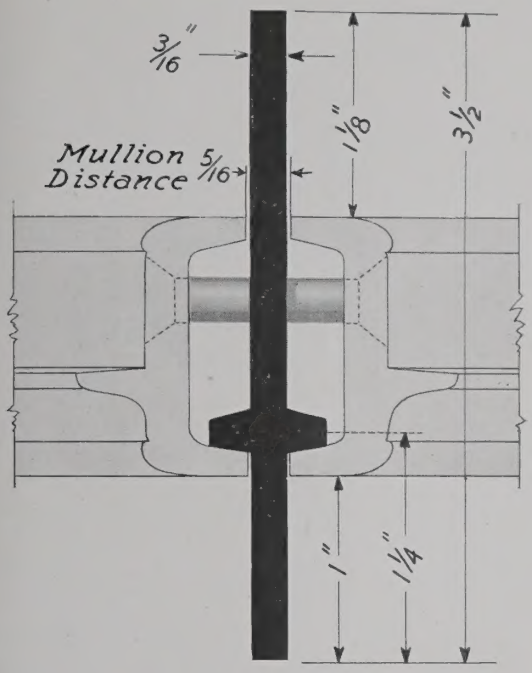
TYPE C MULLION

Type C Mullion is used with all types of ventilated and unventilated sash. Outstanding plates 2½ inches wide are used in heights up to 10 feet and 3½-inch plates up to 14 feet. Wider plates can be furnished where necessary. Type C Mullion is adjustable in width to take up variations in construction.
Mullion plates can be furnished in the following widths: 2″, 2½″, 3″, 3½″, 4″ 4½″.



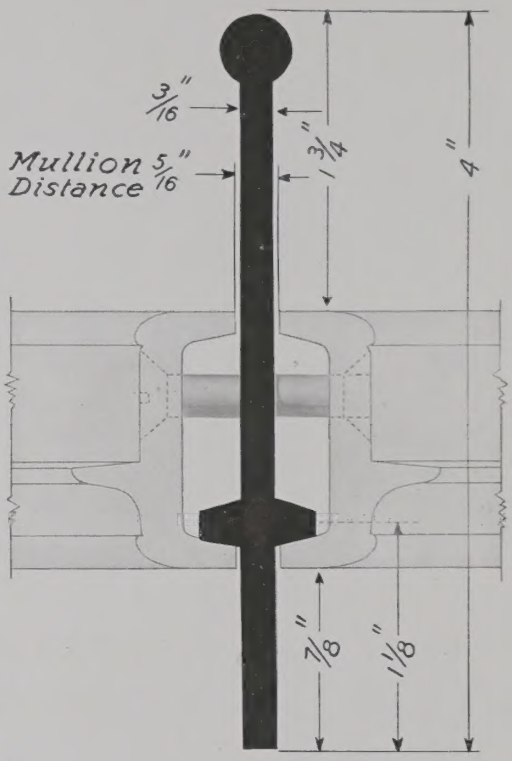
TYPE D MULLION

Type D Mullion is used with all types of ventilated and unventilated sash in height up to 8′–0″. It is adjustable in width to take up variations in construction.
Mullion plates can be furnished in the following widths, 2″, 2½″, 3″, 3½″, 4″ 4½″.



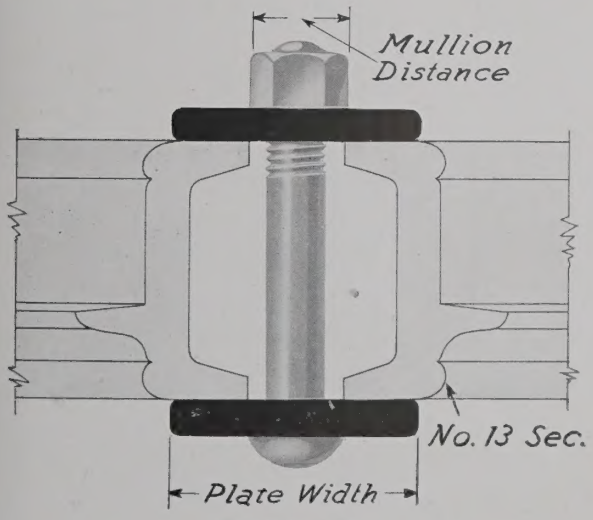
TYPE A MULLION

Type A Mullion is used with all types of ventilated and unventilated sash in heights up to 14′–0″.



TYPE B MULLION

Type B Mullion is used with all types of ventilated and unventilated sash in heights greater than 14′–0″. Also used as Horizontal Mullion in large openings in power houses, etc., when more than one sash in height is required to fill the opening.



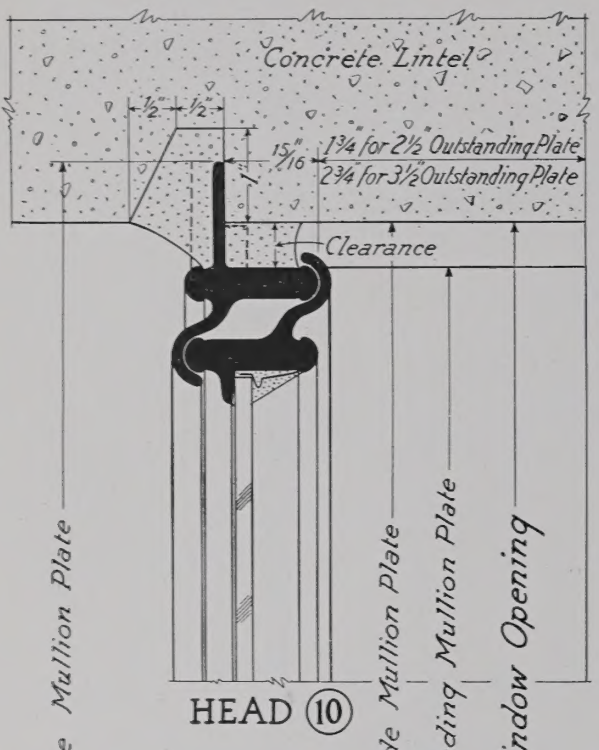
TYPE E MULLION

Type E Mullion is used where ventilators do not extend to mullions, and with unventilated sash in heights up to 10′–0″. It is adjustable in width to take up variations in construction.

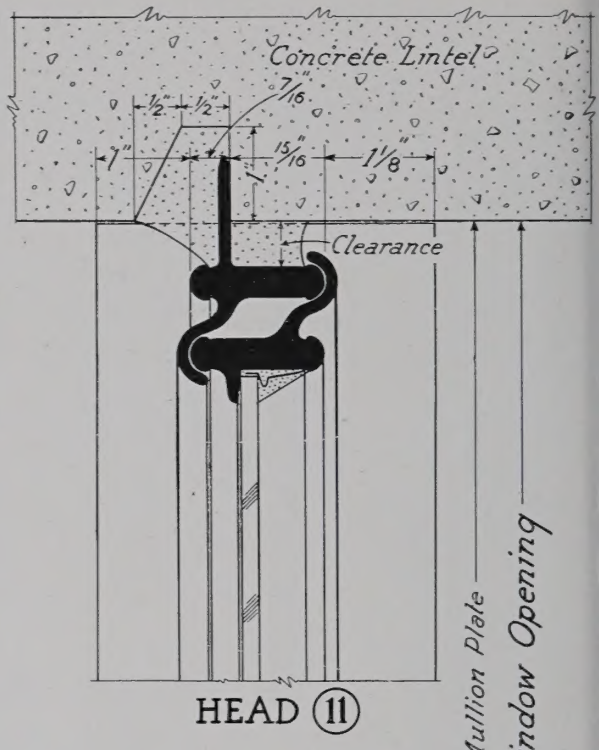
Mullion plates can be furnished in the following widths: 1½″, 2″, 2½″, 3″, 3½″, 4″, 4½″.

Mullion Distances for Various Plate Widths

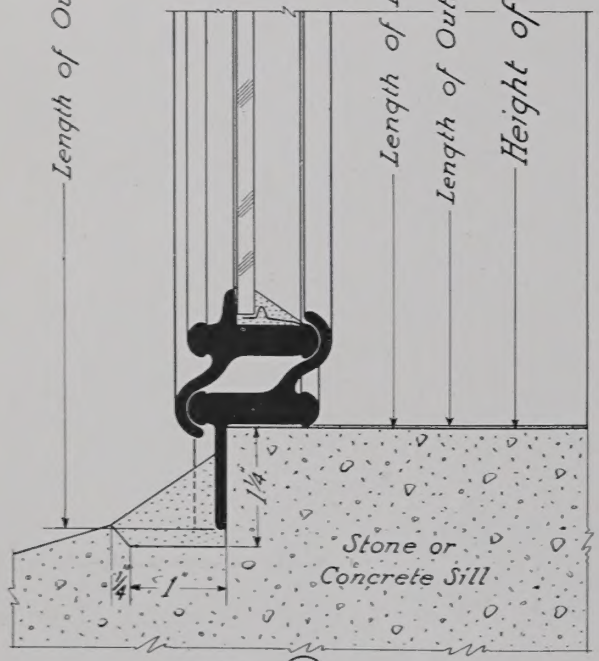
Mullion Type	Mullion Distance	Plate Width
A or B	5/16″	3/16″
C or D	2¾″ to 3″	2″
	3″ to 3½″	2½″
	3½″ to 4″	3″
	4″ to 4½″	3½″
	4½″ to 5″	4″
	5″ to 5½″	4½″
E	½″ to ¾″	1½″
	1″ to 1¼″	2″
	1½″ to 1¾″	2½″
	2″ to 2¼″	3″
	2½″ to 2¾″	3½″
	3″ to 3¼″	4″
	3½″ to 3¾″	4½″



HEAD (10)

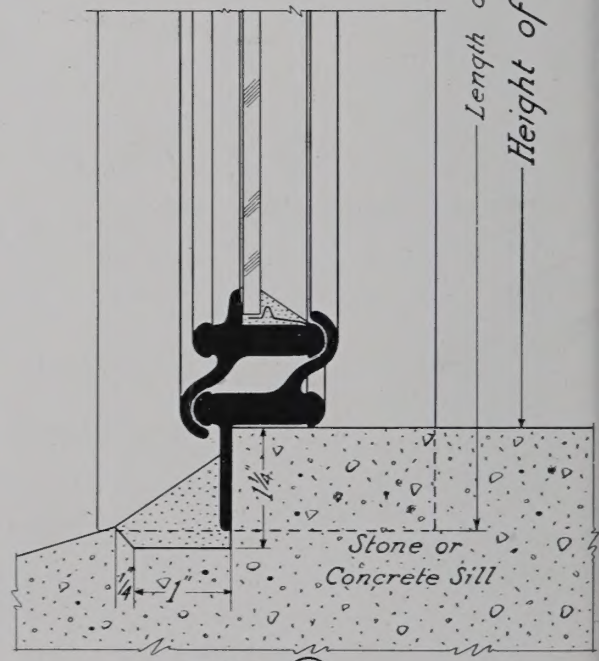


HEAD (11)



SILL (25)

Detail with Mullions Type C & D

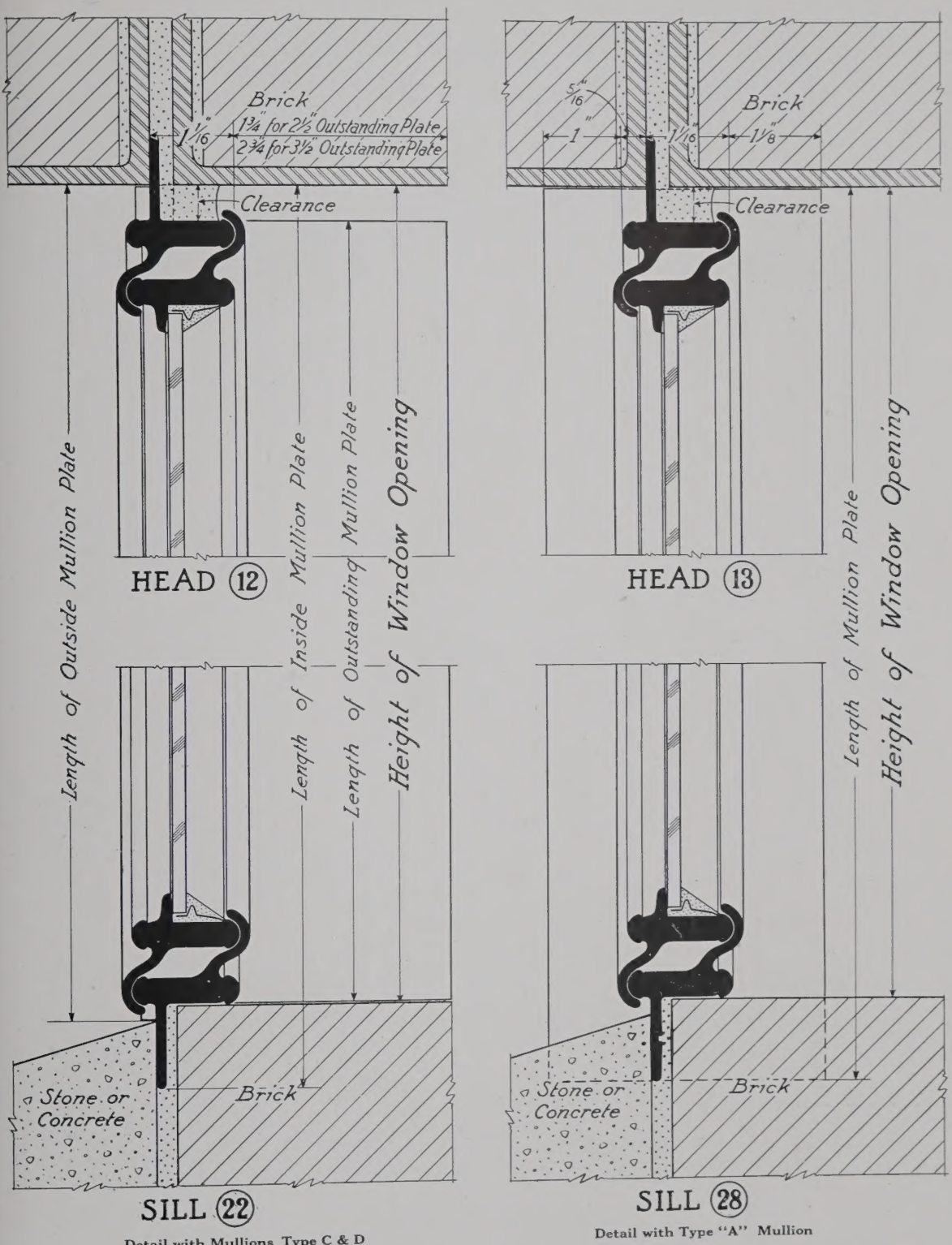


SILL (26)

Detail with Type "A Mullion

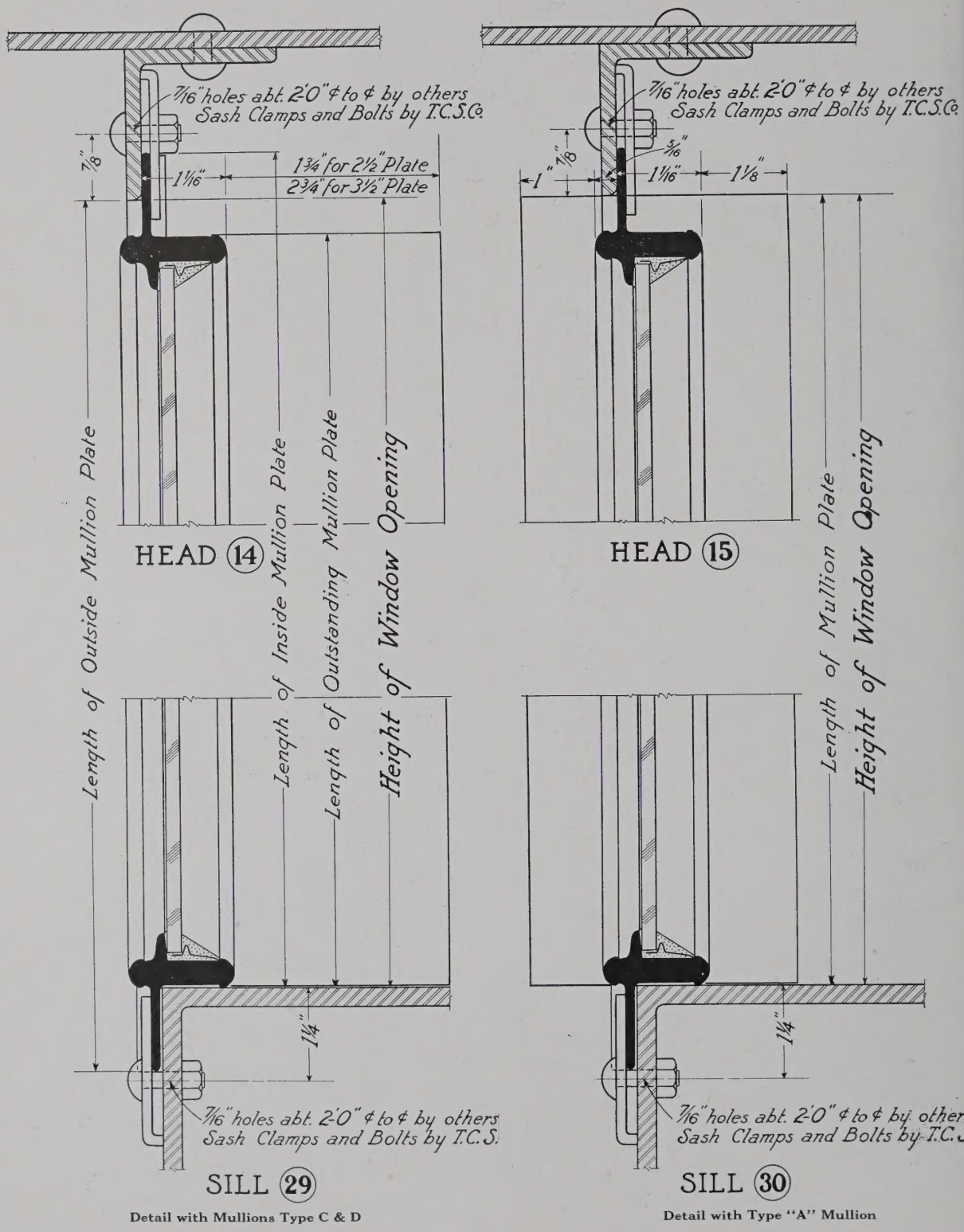
Details of Typical Connections with Concrete Sills and Lintels

One-half Size



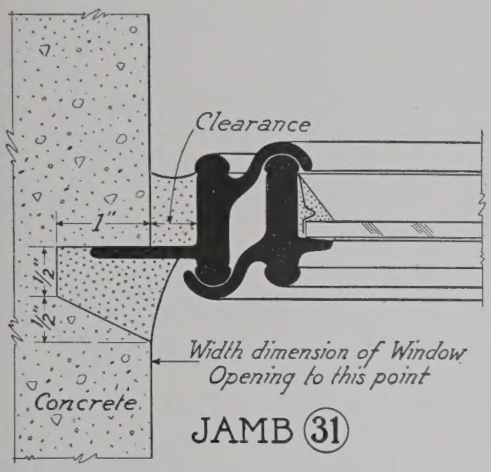
Details of Typical Connections with Steel Lintels and Masonry Sills

One-half Size

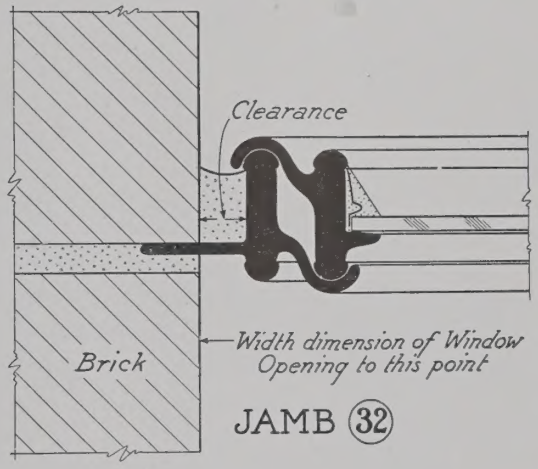

7/16" holes abt. 2'0" ¢ to ¢ by others
Sash Clamps and Bolts by T.C.S.Co.
7/8"
1 1/16"
1 3/4" for 2 1/2" Plate
2 3/4" for 3 1/2" Plate
Length of Outside Mullion Plate
Length of Inside Mullion Plate
Length of Outstanding Mullion Plate
Height of Window Opening
HEAD (14)
7/16" holes abt. 2'0" ¢ to ¢ by others
Sash Clamps and Bolts by T.C.S.Co.
5/16"
1"
7/8"
1 1/16"
1 1/8"
Length of Mullion Plate
Height of Window Opening
HEAD (15)
1 1/4"
7/16" holes abt. 2'0" ¢ to ¢ by others
Sash Clamps and Bolts by T.C.S.
SILL (29)
Detail with Mullions Type C & D
1 1/4"
7/16" holes abt. 2'0" ¢ to ¢ by others
Sash Clamps and Bolts by T.C.S.
SILL (30)
Detail with Type "A" Mullion

Details of Typical Connections with Structural Steel Frame

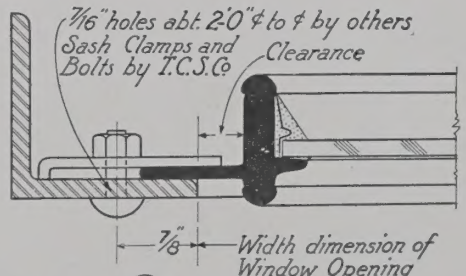
One-half Size



JAMB (31)



JAMB (32)



JAMB (33)

Details of Typical Connections With Concrete, Brick and Structural Steel Jambs

One-half Size

Glazing To-Order Sash

To-Order Sash are glazed either with spring clips and putty or with special glazing angles as shown on the opposite page.

The special spring clips are readily set in place by means of an ordinary putty knife as illustrated. These clips firmly press the glass against the putty and at the same time have enough elasticity to take up the variations in the glass and to absorb the shock of vibration. If desired special glazing pliers for installing clips can be supplied.

Installing Spring Clip with Putty Knife

The continuous ledge, extending along the entire length of the steel section, prevents the putty from working loose or cracking away. The sash sections are so designed that a saving of over 50% is made in the amount of putty required. This fact, together with the use of Spring Clips, makes the cost of glazing United Steel Sash very low.

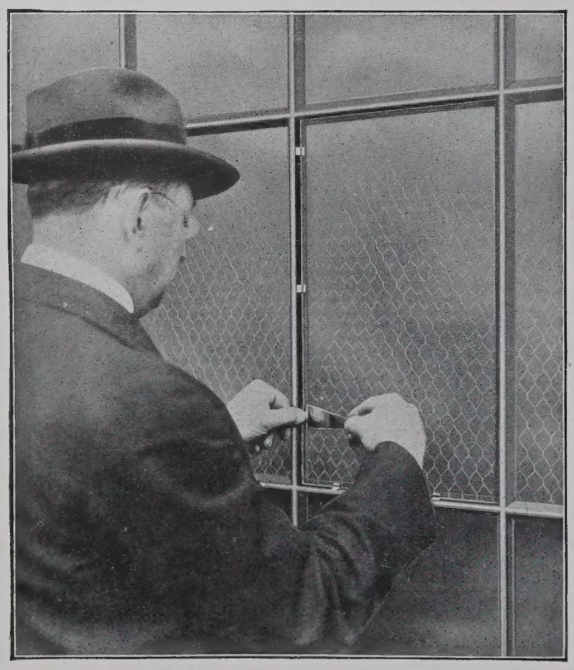
Spring Clip in Place

The glass bears evenly on its four edges against a continuous, one-piece steel section extending completely around the light. There can be no movement at the joint to cause breakage of glass and loosening of putty.

United Steel Sash are adapted to both single and double glazing, as indicated on the opposite page. Spring Clips of proper size for any thickness of glass are furnished free with each order of United Steel Sash.

GLAZING ANGLES — We furnish a special glazing angle for use with United Steel Sash. These angles are readily installed and held in place by means of special glazing turns, designed for the purpose.

GLASS—The top and bottom rows of glass in the ventilators are 7/8" shorter and the glass along the sides of the ventilators is 7/8" narrower than the remainder of the sash. This should be noted in ordering glass.

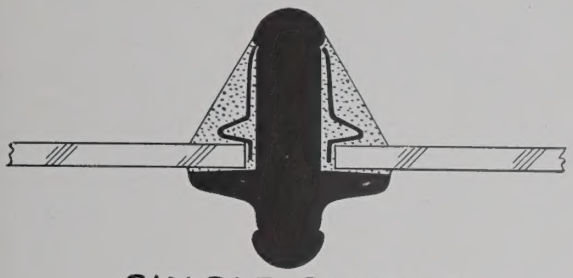


By pushing on the Putty Knife, the edge of the Spring Clip moves towards the sash until it springs in place

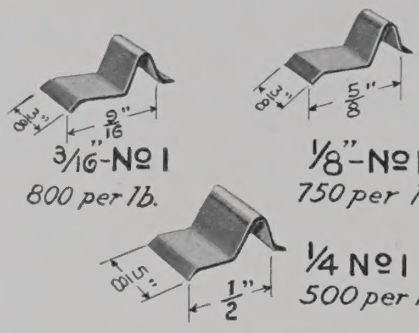
United Steel Sash Putty

United Steel Sash Putty represents the result of extensive practical tests to determine the best product for metal sash. It glazes easily and smoothly, shows a perfect adhesion for both metal and glass, hardens throughout evenly and uniformly in a comparatively short time to a tough and resistive body, costs no more than any good putty and gives results that are far more efficient and satisfactory.

Glazing To-Order Sash



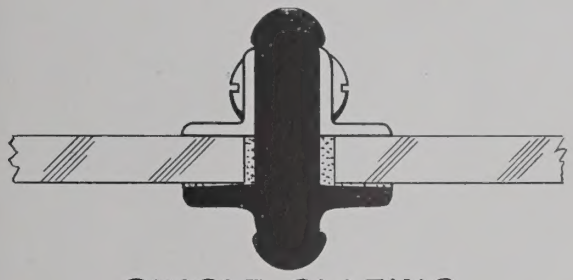
SINGLE GLAZING
(With Glazing Clips)



3/16"-No 1
800 per lb.

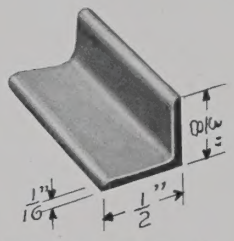
1/8"-No 1
750 per lb.

1/4 No 1
500 per lb.

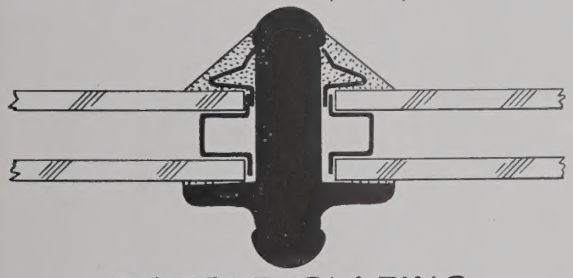


SINGLE GLAZING
(With Glazing Angle)

GLAZING TURN

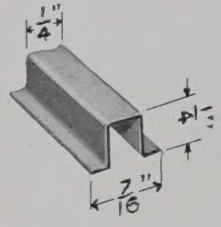


GLAZING ANGLE

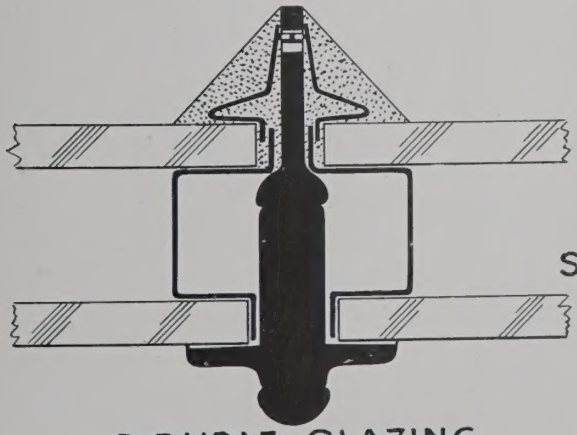


DOUBLE GLAZING
(With 1/4" Air Space)

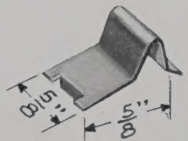
1/8 No C
1000 per lb.



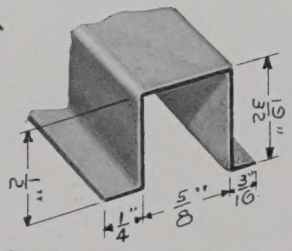
DOUBLE GLAZING
Spacer No C



DOUBLE GLAZING
(With 3/4" Air Space)



SPECIAL No 9
350 per lb.



DOUBLE GLAZING
Spacer No 9

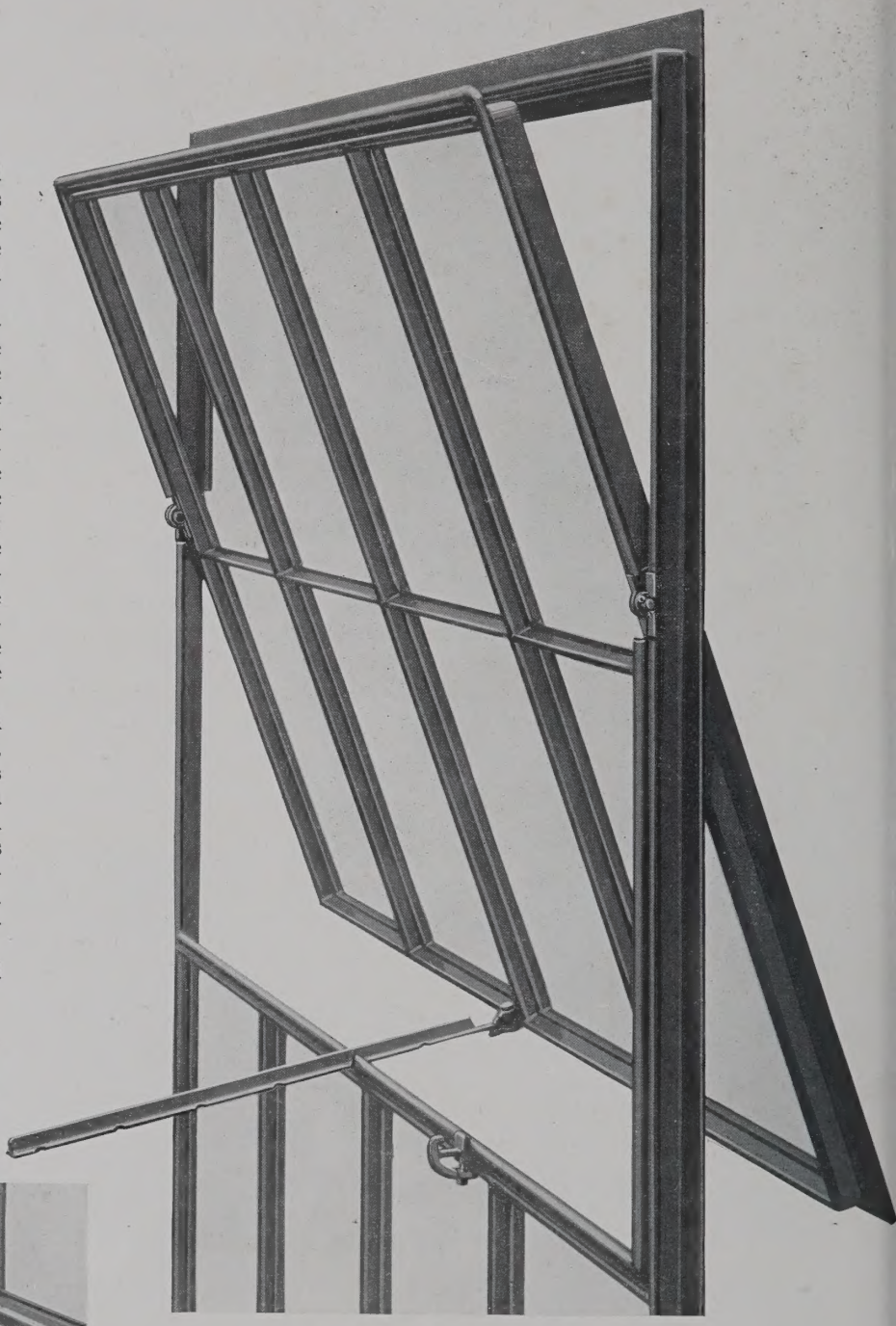
E1 hardware is furnished with ventilators of this type unless other hardware is specified. Note the simplicity of operation and perfect locking device.

Ventilators may be opened at practically any angle up to 60 degrees, unless the ventilators extend to the sill in which case they can be held open in two positions only. They can be opened slightly or must be opened to the fullest extent. If desired the sills can be constructed with an extreme pitch on the inside to eliminate the interference of the sill with the proper operation of the bar.

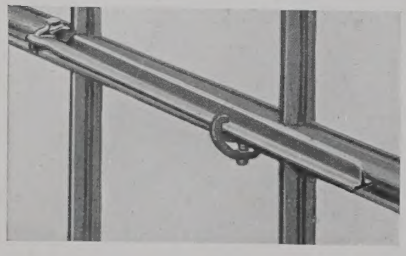
Bars are furnished in stock lengths of 10, 13, 16, 19, 22 and 25 inches depending upon the width of the ventilator. If a special length of bar is required it must be specified when ordering the sash.

All castings are of malleable iron sherardized.

All hardware is attached in the shop.



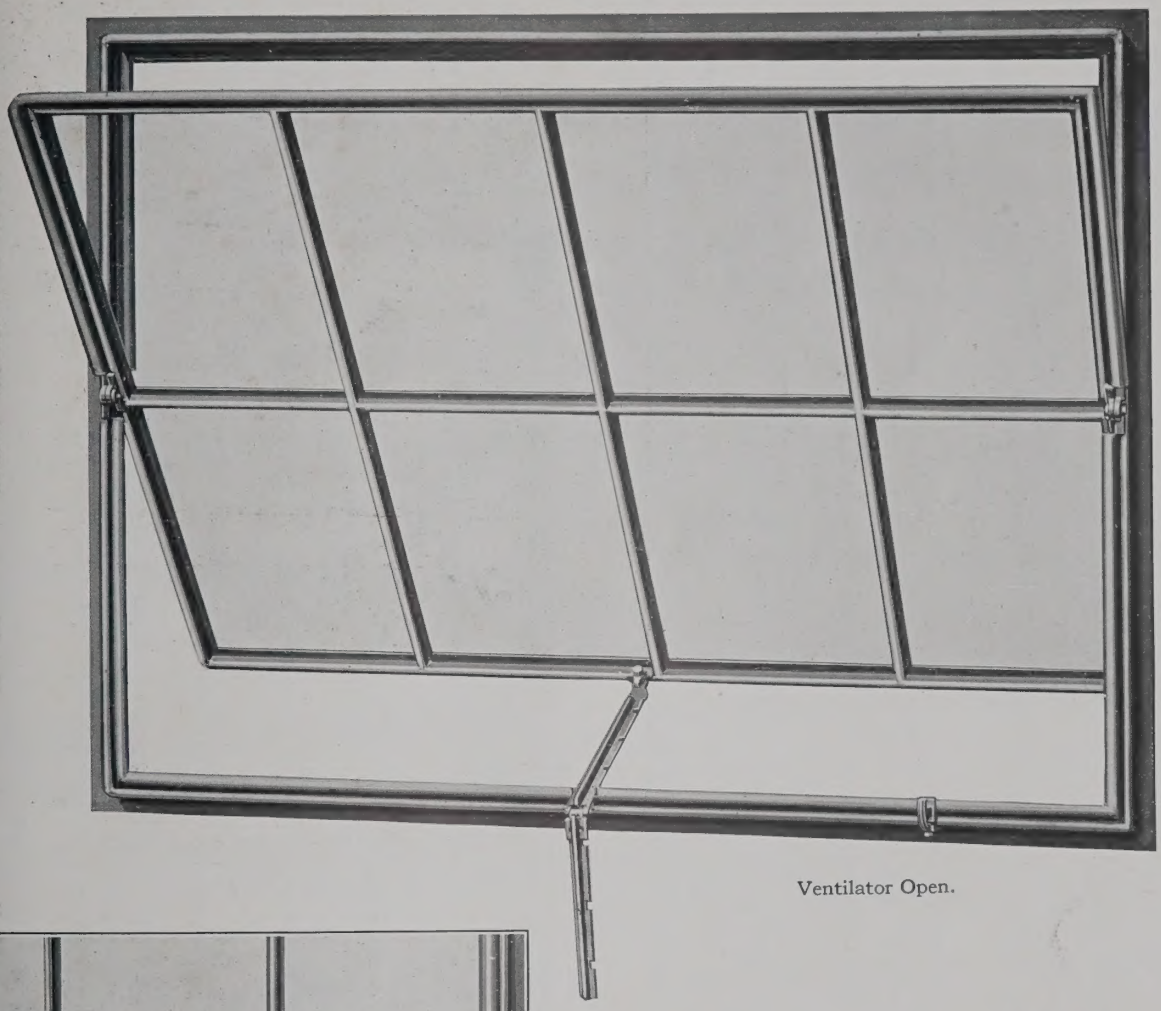
Ventilator Part Way Open.



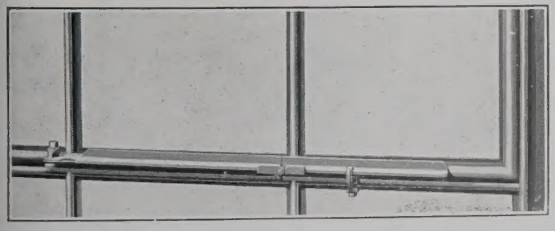
Ventilator Closed and Locked.

Set E1 Hardware

For Ventilators Horizontally Pivoted at Center or Near Top



Ventilator Open.



Ventilator Closed and Locked.

Set E3 Hardware

For Ventilators Horizontally Pivoted at Center or Near Top

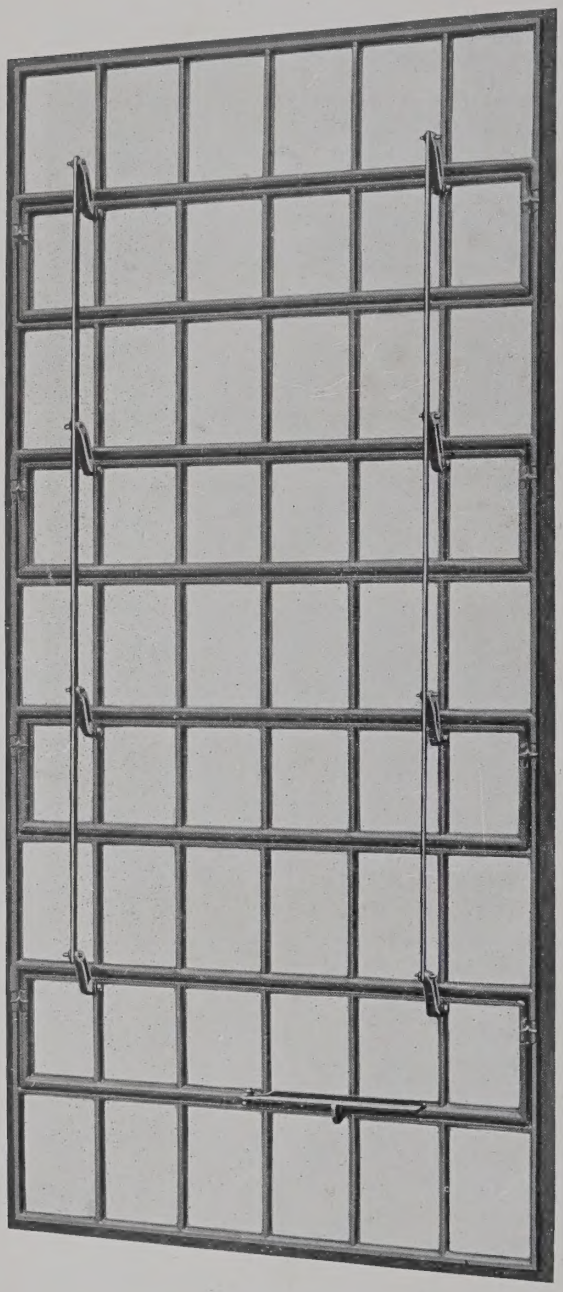
This hardware is furnished only when specified. The advantage of this hardware is that the push bar does not extend beyond the wall line when the ventilator is partially opened. ***It can be used only when there is a fixed light below the ventilator.***

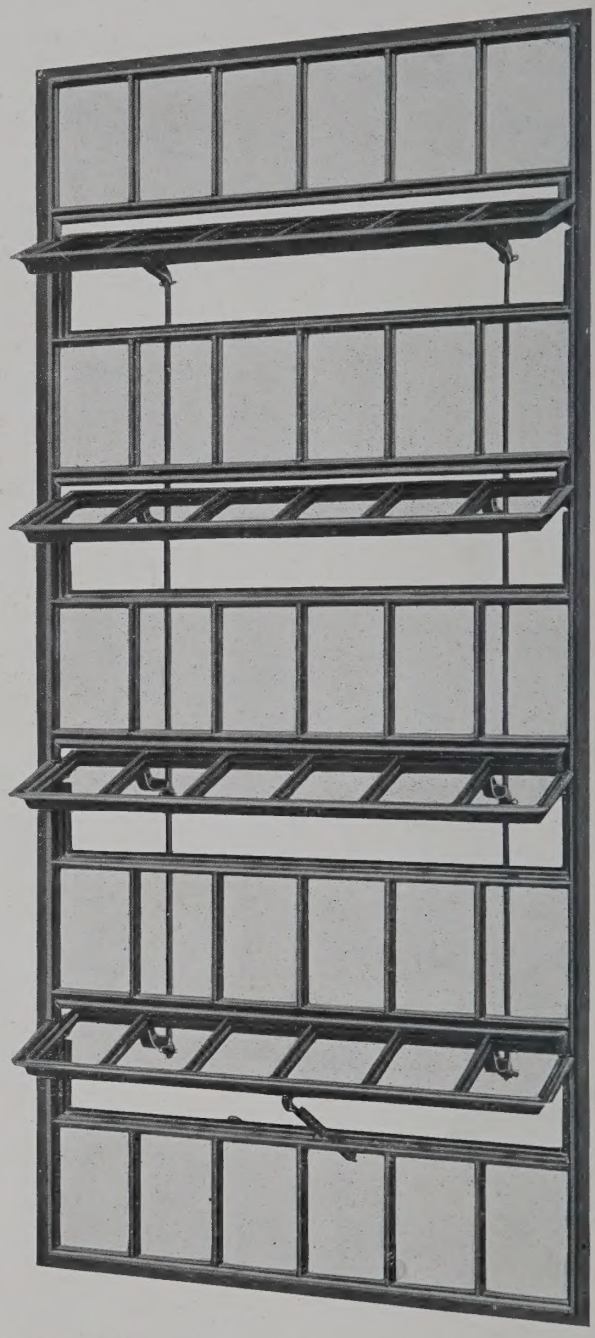
Bars are furnished in stock lengths of 10, 13, 16, 19, 22, and 25 inches, the joint being located approximately at the center of the bar. If a special length of bar is rquired it must be specified when ordering the sash.

All castings are of malleable iron sherardized.

This hardware is attached in the shop.

Note—We do not recommend this type of bar. It should be used only where absolutely necessary.





Set E6 Hardware

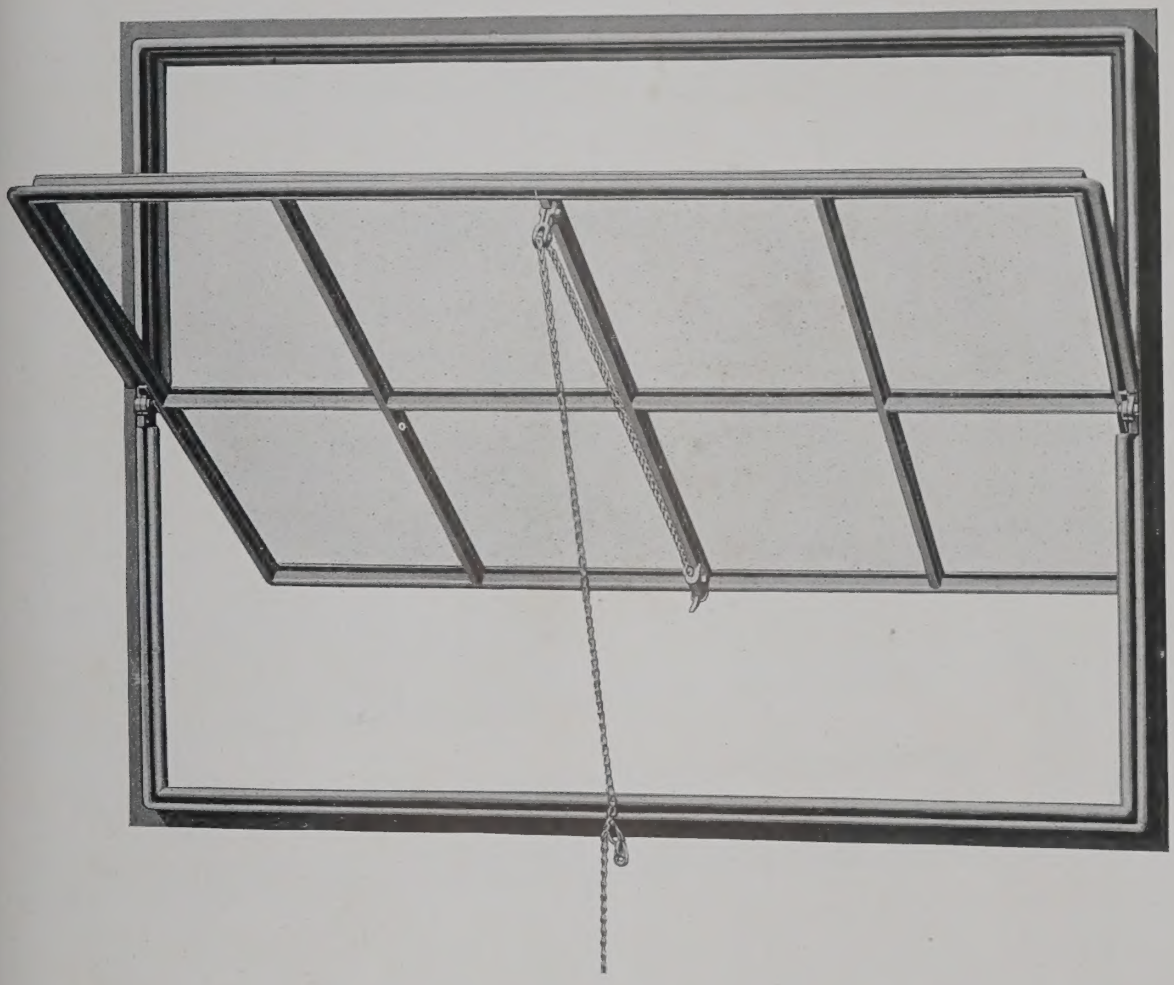
This hardware is furnished only when specified. For use on ventilators as illustrated—not exceeding 18 inches high.

Connecting bars must not exceed 6 feet in length between bar supports.

All castings are of malleable iron sherardized.

Connecting bars and bar supports are carefully boxed and listed and shipped with the sash and must be attached by contractor erecting the sash.

Push bars with push bar supports and latches are attached in the shops.



Set A2 Hardware

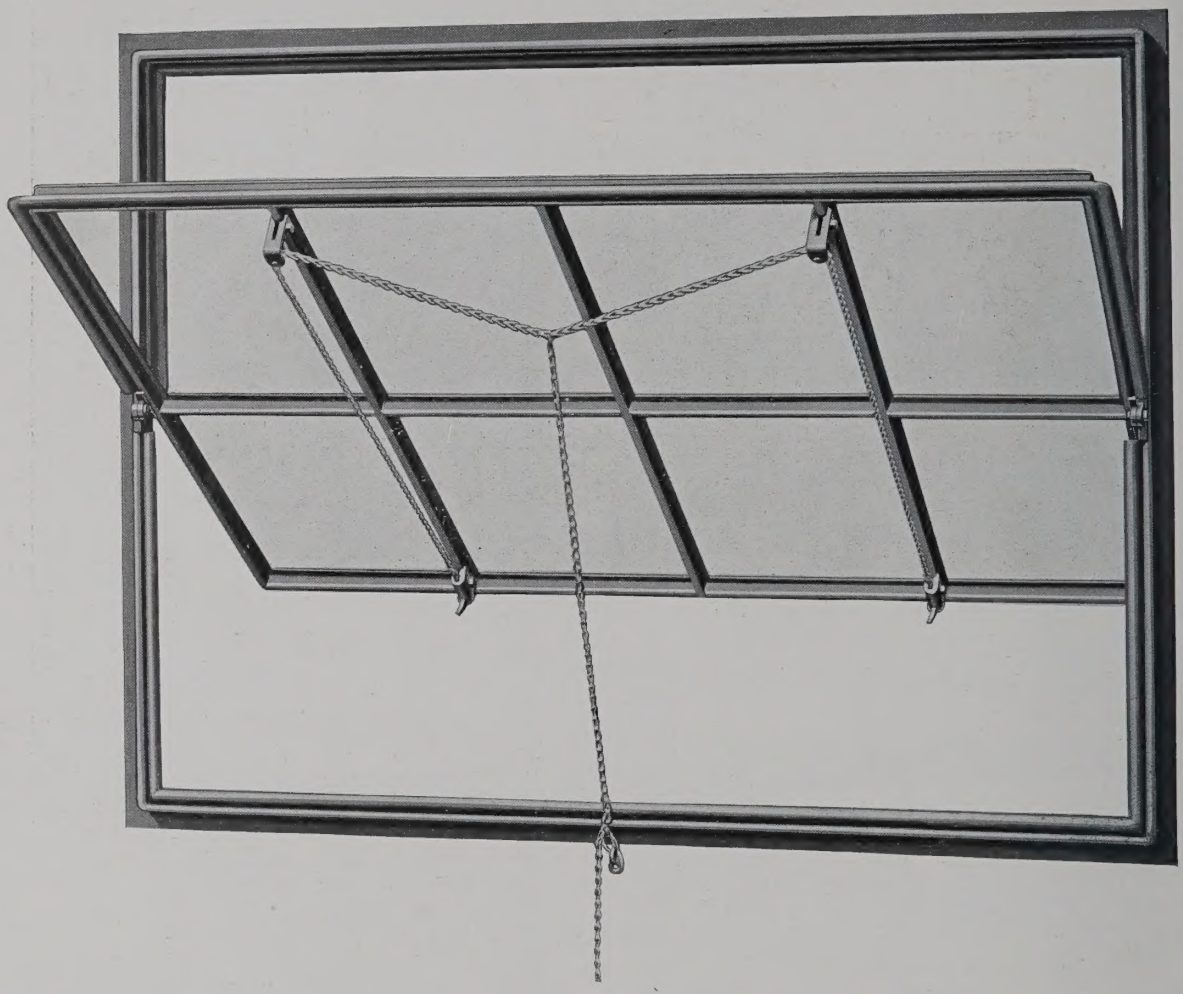
For Horizontally Pivoted Ventilators

This hardware is furnished only when specified. It is used with ventilators horizontally pivoted near the center.

The castings are manufactured of either malleable iron or brass.

This hardware is carefully boxed and listed and is shipped with the sash. It must be attached to the sash in the field by the contractor erecting the sash.

For ventilators over 4 feet in width we recommend Set A-3 hardware shown on following page.



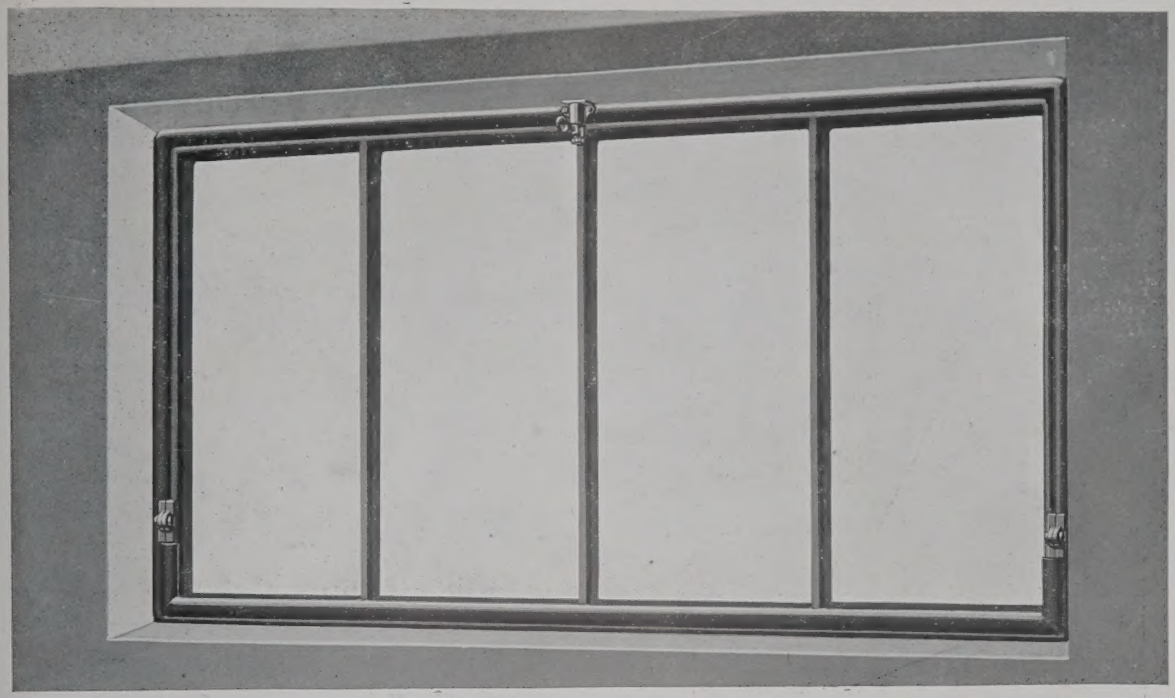
Set A3 Hardware

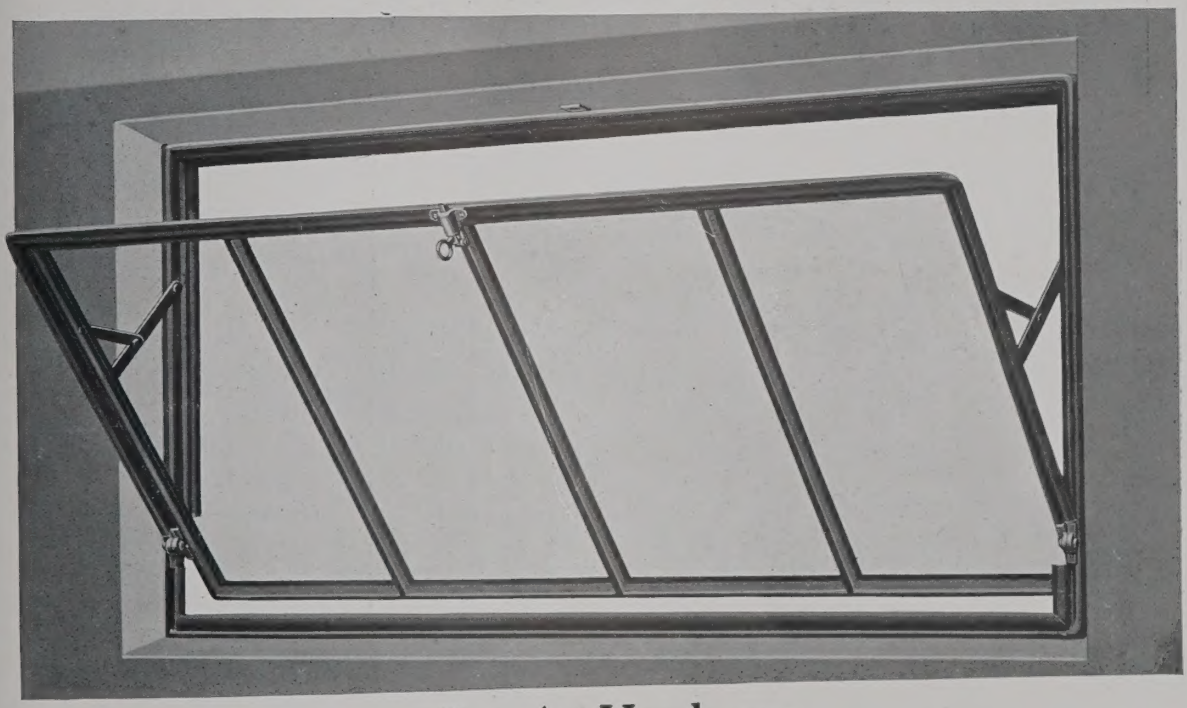
For Horizontally Pivoted Ventilators

This hardware is furnished only when specified. We recommend this hardware for ventilators having an odd number of lights in width or where the ventilators are 4 feet or over in width.

Castings can be furnished in malleable iron sherardized or brass.

All hardware is carefully boxed and listed and shipped with the sash. It must be attached to the sash in the field by the contractor erecting the sash.





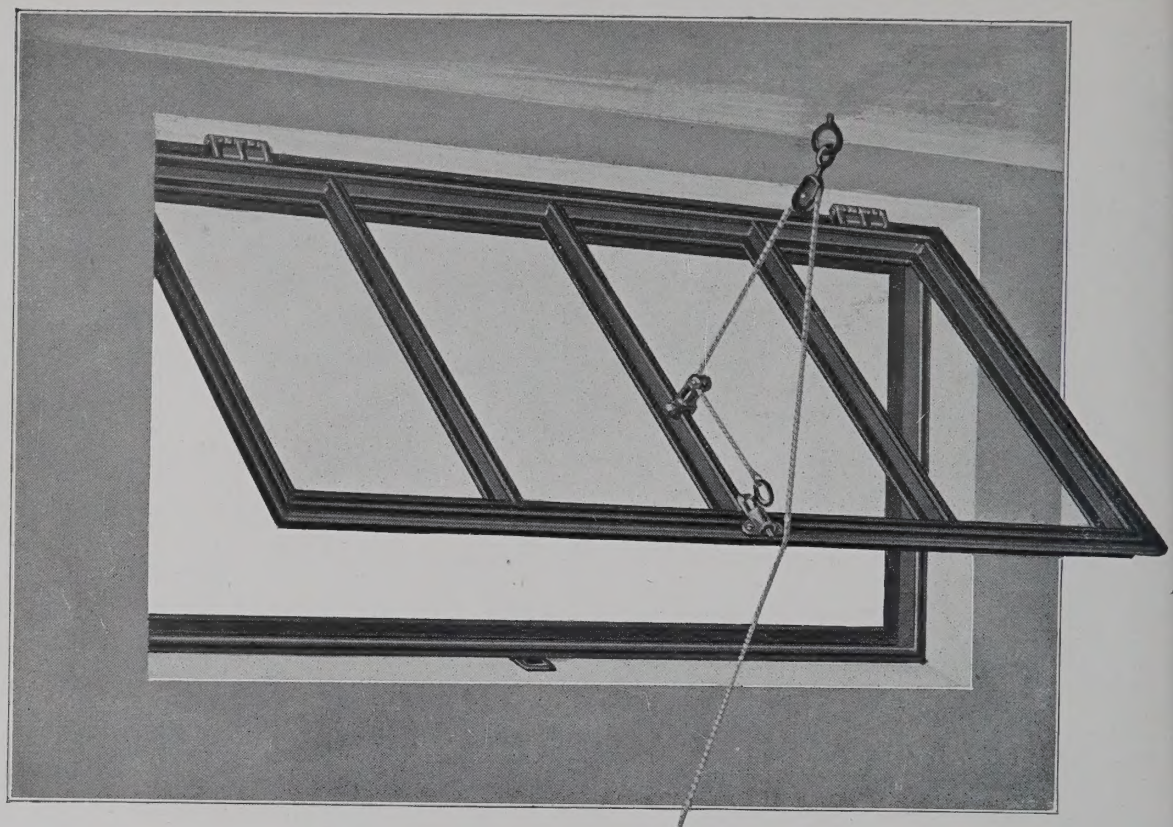
Set A4 Hardware

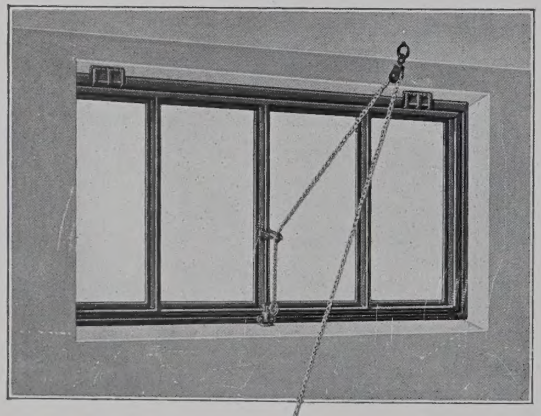
For Ventilators Hinged at Bottom or Pivoted at the Sides Below the Center

A4 hardware is supplied for all ventilators of this type unless a mechanical operating device is specified. All castings are of malleable iron sherardized or of brass.

Ventilators 30 inches or over in height will open approximately 16 inches at the top. Ventilators less than 30 inches in height will open approximately to an angle of 30 degrees.

Ventilator stops are attached in shops. All other hardware is carefully boxed, listed and shipped with the sash, and must be attached to the sash in the field by the contractor erecting the sash.





A5 hardware is supplied for all ventilators of this type unless a mechanical operating device is specified.

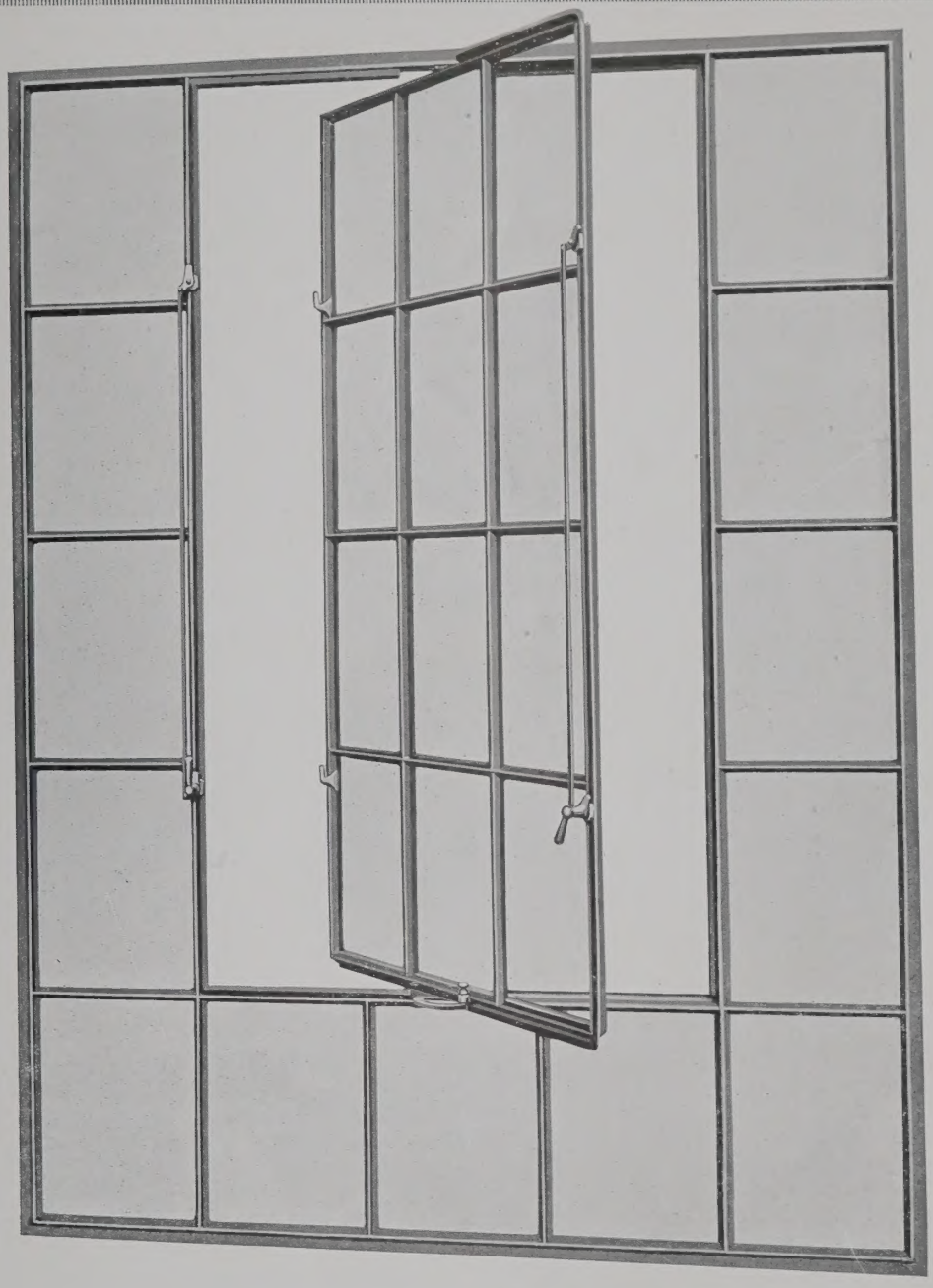
In using this type of ventilator with transom hinges care should be taken to allow sufficient clearance at the top for the hinges and at the bottom for the No. 5 section on the ventilator. With the No. 528 section at the top at least ¾ inch should be allowed, and ½ inch with the No. 524 at the bottom. The No. 13 section should never be used either at top or bottom.

All castings are of malleable iron sherardized or of brass.

Hinges are attached in shop. Other parts carefully boxed and listed and shipped with sash. To be attached in field by contractor erecting sash.

Set A5 Hardware

For Ventilators Hinged at the Top or Pivoted at the Sides Above the Center, Bottom of Ventilator Swinging in



Set D1 Hardware

For Vertically Pivoted Ventilators with No. 5 Section Weathering

This hardware is supplied for all ventilators of this type unless a mechanical operating device is specified.
With this type of hardware ventilators can be pivoted at the center or 7½ inches from either side to swing in or out.
When mechanical operation is specified the standard pivot as shown on Page 3 is furnished.
Ventilators should be limited to 3′–6″ in width and 7′–0″ in height.
We recommend that all ventilators be locked along both vertical edges and that locking devices be spaced not more than 3′–6″ apart. If desired, however, we will supply hardware for one side only.
All ventilators over 3′ in height should have at least two locking devices on each vertical edge.
This type of ventilator should not be used adjacent to Type A mullion on account of interference with hardware.
Castings can be supplied in either malleable iron or brass.
All hardware is attached in the shop except segment adjuster which must be attached in the field by sash erector.

Instructions for Ordering To-Order Sash

The following information should be furnished with each order for United Steel Sash:

1st. Name.

Give the name of the consignee, architect or engineer, owner and the name or title of the building.

2nd. Shipping Directions.

Show clearly the railroad to be shipped over, point of delivery, the date on which shipment is required and complete billing instructions.

3rd. Type of Sash.

Show the catalogue type, or a sketch of the sash required, giving the number, arrangement and size of lights with ventilation required.

4th. Details.

Give detail numbers of sills, lintels and jambs (see pages 72 to 75) or show special details required.

This information is necessary that the outside sash sections may be furnished correctly, mullions cut properly and notched where necessary. Show all opening dimensions, with allowable variations, if any.

5th. Hardware.

Specify the TYPE of hardware and FINISH required, whether in malleable, brass, or bronze. See Hardware Catalogue. Show the sill heights at each opening so that chain can be furnished in proper quantity. When ordering mechanical operators, state the type and sash embodied in each run; furnish complete plans and details of building so that operator can be designed properly.

6th. Glass, Glazing and Putty.

State whether putty or glazing angles are to be used; kind of glass and whether inside or outside glazing.

If outside glazing is required, state whether leg of No. 124 or No. 128 section is to be regular or reversed.

State the thickness of glass to be used that proper clips may be furnished.

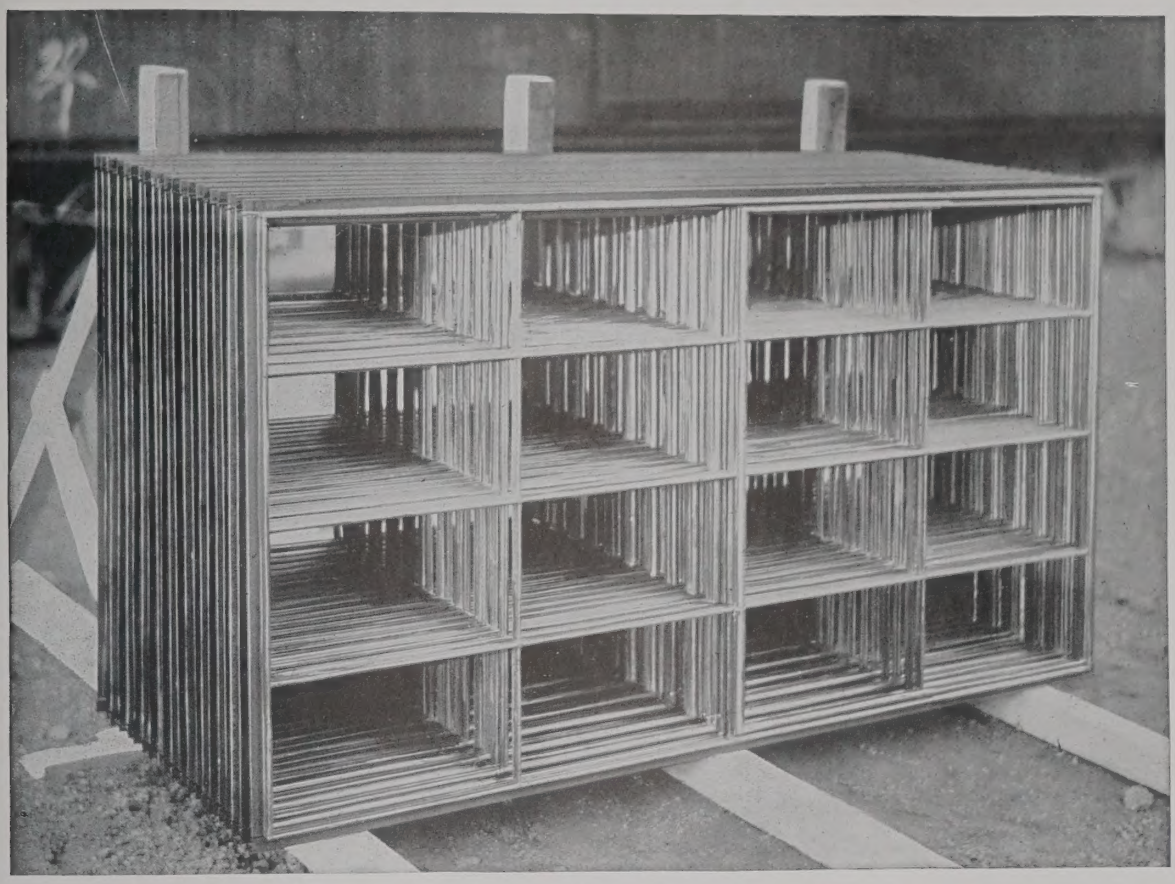
Specify color of putty to be supplied. Red putty is furnished unless otherwise specified.

7th. Miscellaneous.

Furnish all information regarding any special details, or material to be furnished with sash, such as structural steel, expansion bolts, inserts, provision for curtain brackets or screens.

8th. Approval.

In all cases where drawings or sketches are sent in with contract such drawings or sketches should contain the approval of the purchaser or architect, in writing, before manufacture will be started.



Proper Method of Stacking Sash when Received at Building Site

Instructions for Handling and Installing United Steel Sash

United Steel Sash are subjected to a very rigid inspection before leaving the factory, to insure their being in perfect condition. If the following suggestions are carried out there will be no difficulty experienced in keeping the sash in this perfect condition, and they will be readily installed, giving entire satisfaction.

All sash containing ventilators have small blocks inserted between the ventilators and the sash and have the ventilators tightly wired to the main frame. ***These wires and blocks must not be removed until the sash is erected in the opening and rigidly fastened in place ready to receive the glass.***

Stacking

When the sash arrive at the building site, they should be stacked on edge as shown in illustration above. This is readily accomplished by using three 2 x 4 stringers, with braces on one end. Care should be taken to see that the sash are not warped or twisted. Sash must not be laid horizontally nor piled one upon the other.

(Concluded on next page)

(Concluded from preceeding page)

Erection

The sash must be blocked up in position as shown in cut below. In blocking up, care must be exercised in placing the sash plumb in a true vertical plane, and to have the horizontal muntins of adjoining units in the same horizontal line. This is best accomplished by using a carpenter's level and chalk line. The line must be stretched horizontally between columns, and the muntins must be lined up with it, care being taken to keep the several units plumb and in the same vertical plane. Ample clearance should be given at lintels, jambs and sills to allow the ventilators to swing freely. ***It is important that blocks should not be placed in any other position than that shown in the illustration on preceding page.***

The sash are not designed to carry the weight of any of the building construction. It will be necessary to provide the requisite structural material to support such loads.

Where mullions are furnished, the necessary bolts are supplied. We do not furnish any other structural steel connections, such as angles, bolts, plates, clips, etc. Type E1 hardware is attached to the sash before shipment. Other types come carefully boxed and listed. This hardware must be attached after sash are glazed, and is put on by contractor erecting the sash.

Glazing

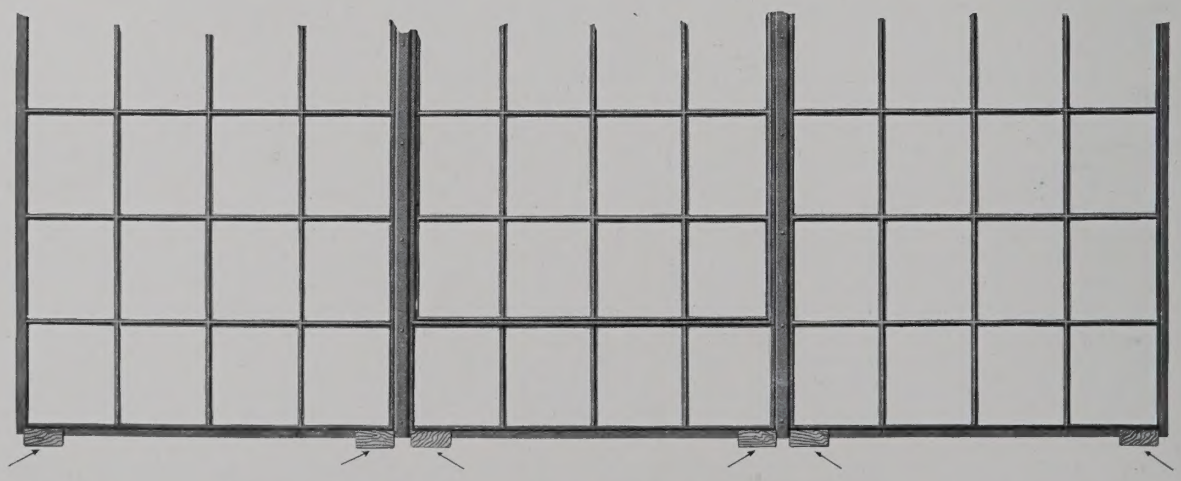
Spring steel glazing clips are supplied with each contract. Six clips should be used with each pane of glass, two on each side and one each at top and bottom.

The glass must be properly back-puttied and the putty neatly struck off after the glass has been bedded and fastened with the spring clips.

Stock and Semi-stock Units of United Steel Sash are designed to permit of glazing from the inside of the building only.

We recommend the use of putty which does not depend upon absorption for hardening but hardens within itself, and adheres tightly to glass and steel. To obtain the best results United Steel Sash Putty should be used.

The top and bottom rows of glass in the ventilators are 7/8" shorter and the glass along the sides of the ventilators is 7/8" narrower than the glass in the remainder of the sash. This should be noted in ordering glass.



Proper Method of Blocking up Sash with Horizontally Pivoted Ventilators.

Blocks Must be Placed as shown.

Do not Place Blocks Under Any Other Part of Sash.

A FEW PHOTOGRAPHS

FROM THOUSANDS OF

IMPORTANT INSTALLATIONS

—OF—

PIVOTED UNITED STEEL SASH

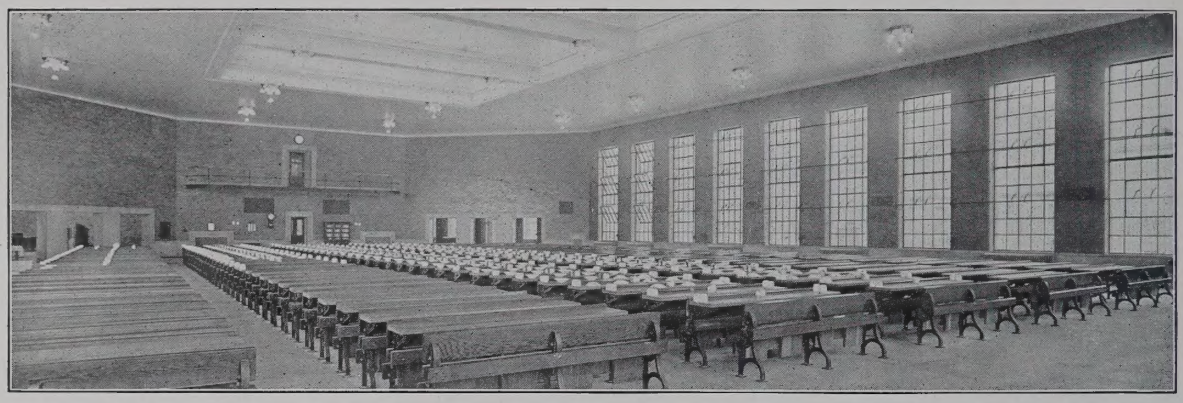
Hill Publishing Co. Building, New York Starrett & Van Vleck, Architects

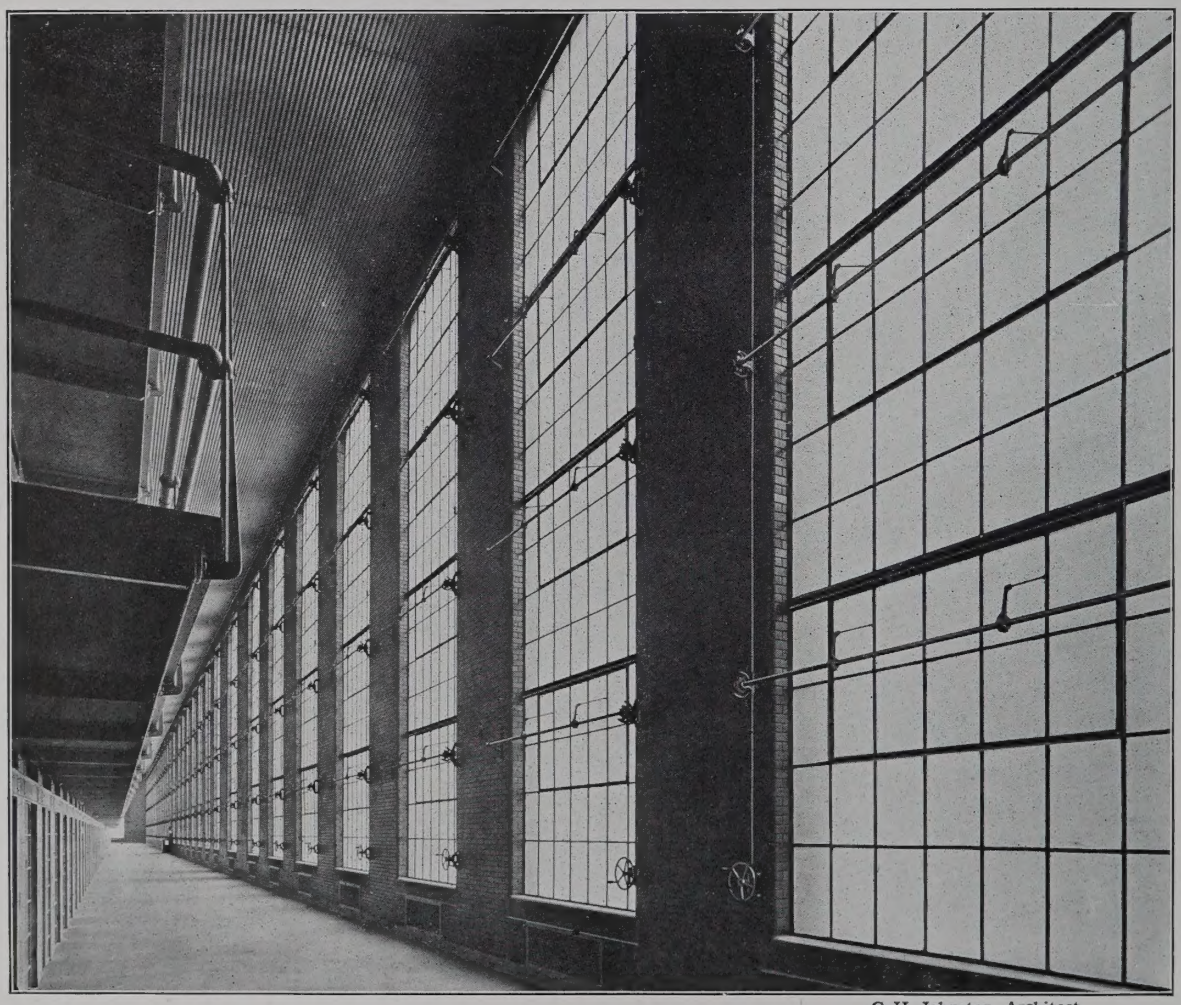
Windows of United Steel Sash—Vertically Pivoted

Sauer & Hahn, Architects

Metzger Building, Philadelphia, Pa.

All windows above first floor are United Steel Sash. Fireproof construction of Kahn System of Reinforced Concrete, flat slab type.

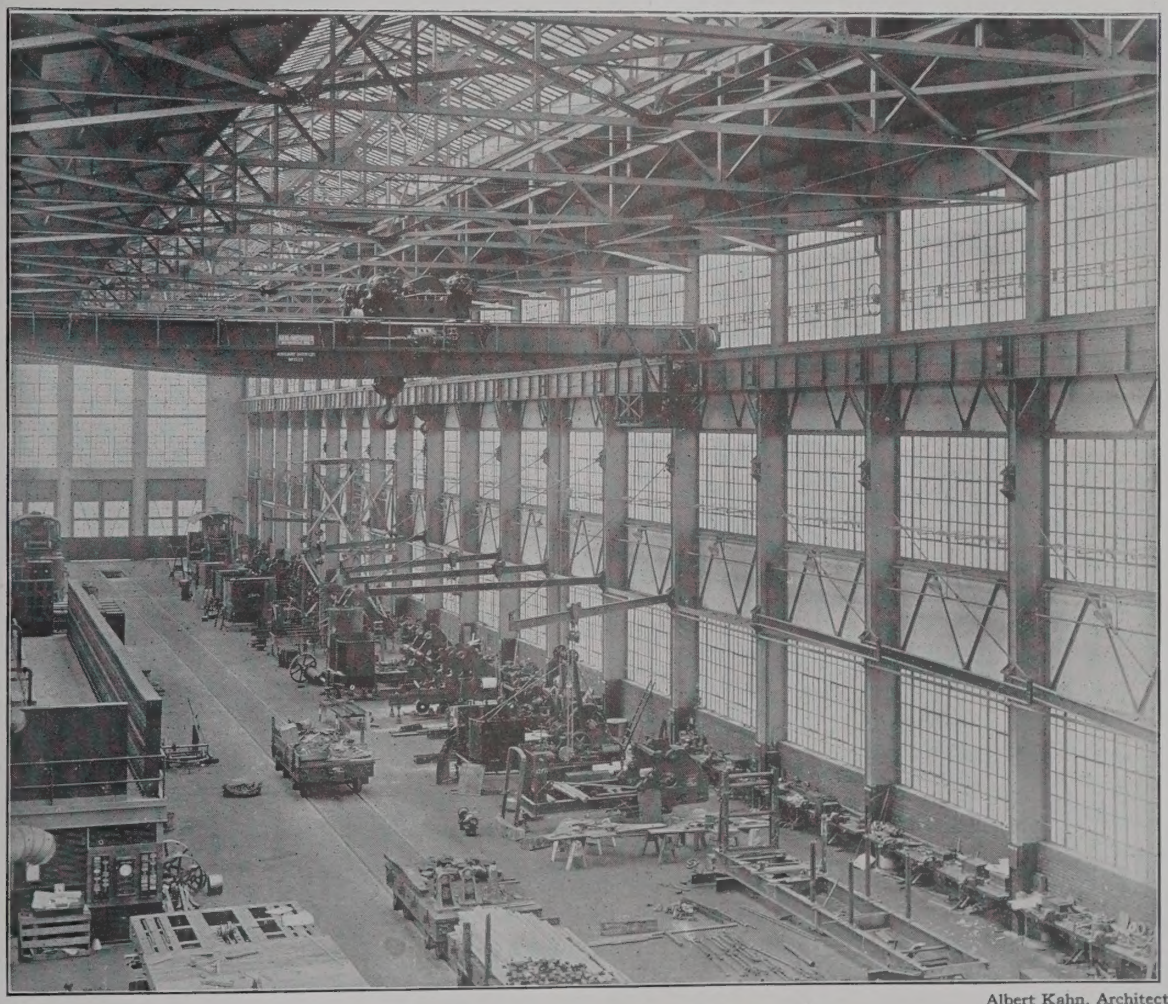




C. H. Johnston, Architect

Minnesota State Prison, Stillwater, Minn.

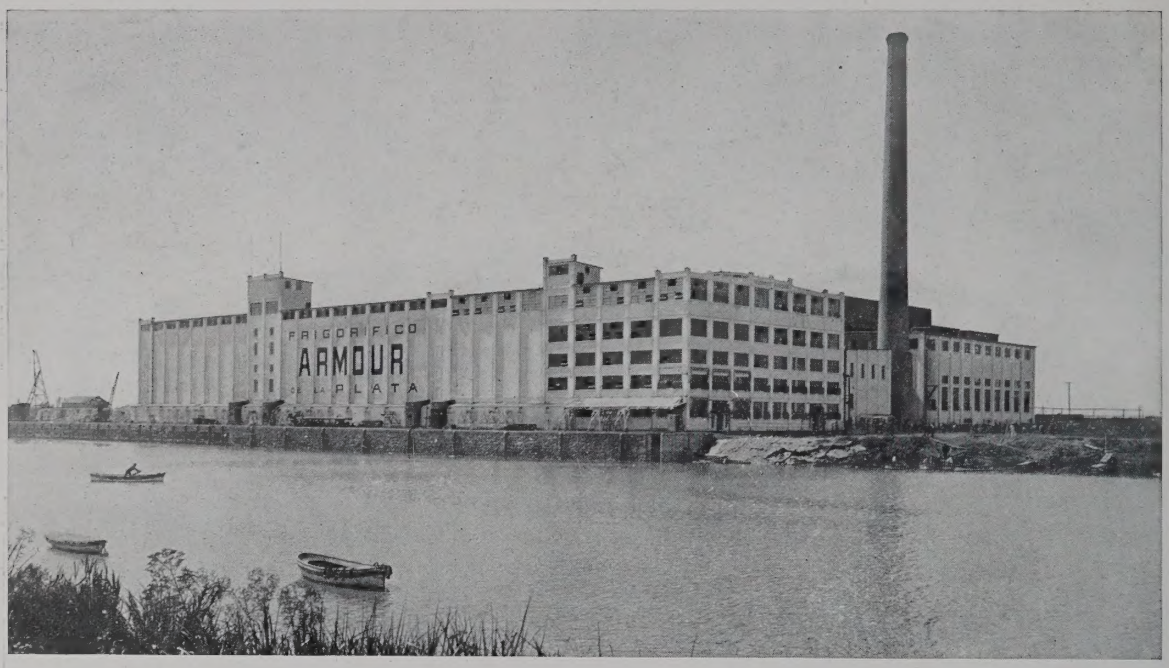
United Steel Sash used throughout dining hall, cell houses, administration building, chapel, and power house.



Albert Kahn, Architect
Ernest Wilby, Associate

Industrial Works, Bay City, Michigan

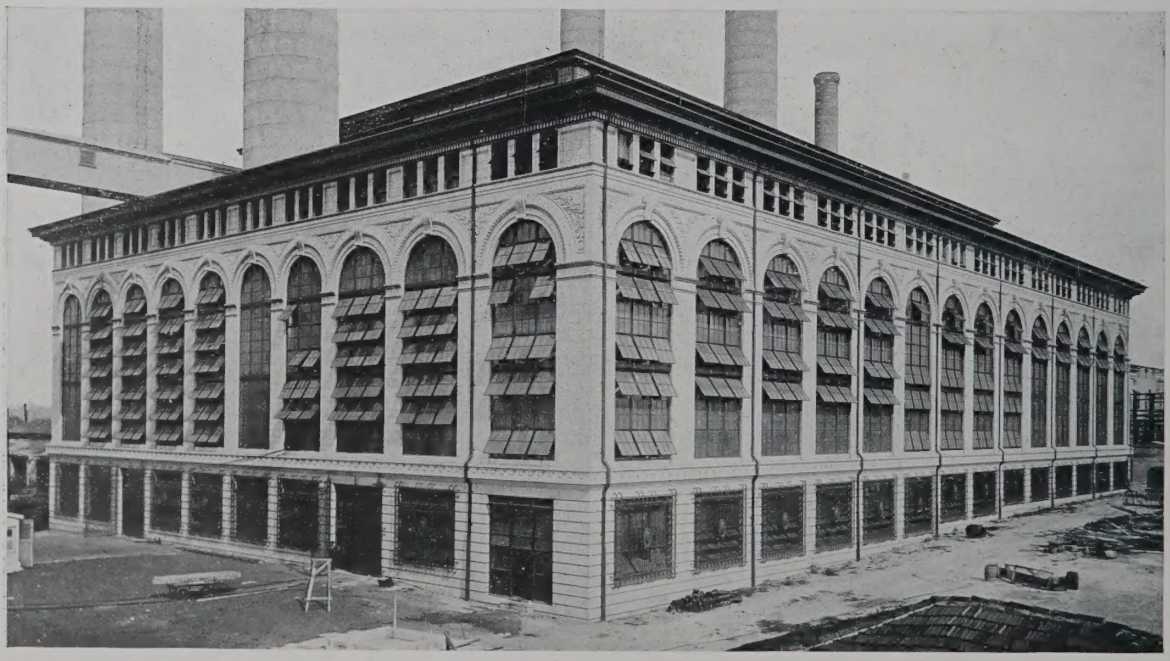
Perfect daylighting and thorough weathering protection assured by windows of United Steel Sash. Hy-Rib Concrete sidings and roofs



A. M. Libby, Chief Resident Engineer

Refrigerator Plant of Armour and Co., La Plata, Argentine Republic

United Steel Sash throughout.



Snare & Triest, Contractors

Chas. A. Ricker, C. E., Engineer

Havana Railway, Light and Power Co., Havana, Cuba.

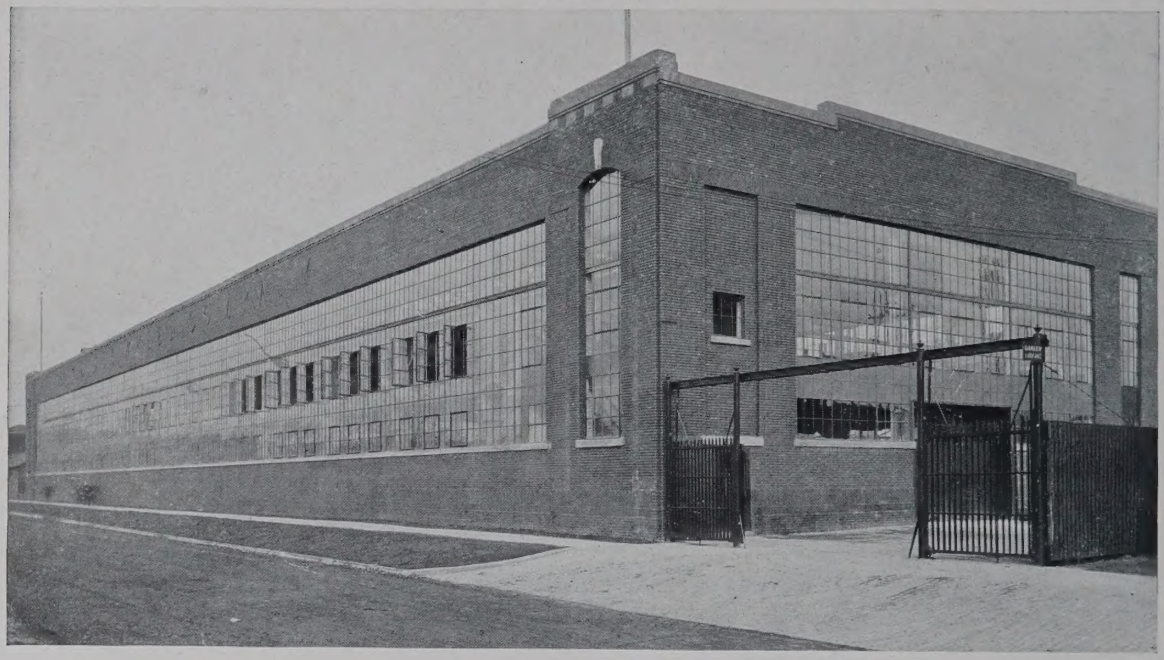
100% Ventilation with United Steel Sash, with Ventilators horizontally pivoted near top.

Albert Kahn, Architect
Ernest Wilby, Associate

Manchester Avenue Building of the Ford Motor Co., Highland Park, Mich.
100 per cent ventilation obtained by using Vertically Pivoted United Steel Sash.

Osborn Engineering Co., Architects

Wagner Manufacturing Co. Building (Cleveland-Akron Bag Co.), Cleveland, Ohio.
Vertically Pivoted United Steel Sash used throughout for windows.



Albert Kahn, Architect
Ernest Wilby, Associate

Kelsey Wheel Co., Detroit, Mich.
Large Expanse of Vertically Pivoted United Steel Sash

E. W. Russ, Architect

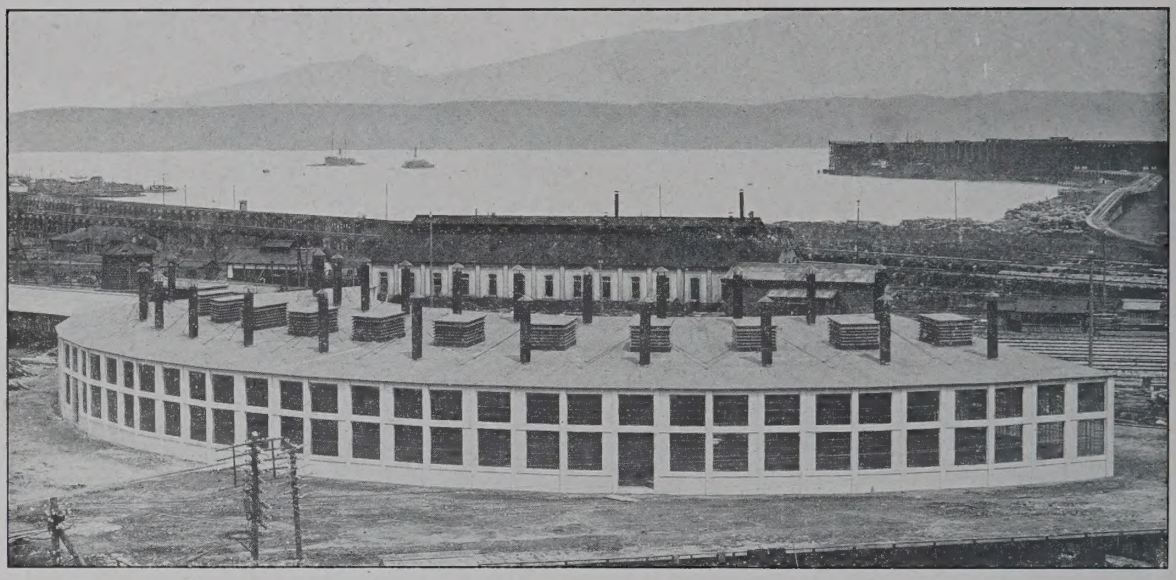
Piqua Hosiery Company, Piqua, Ohio.

The large ventilators of the United Steel Sash are pivoted at the top to permit the use of shades.

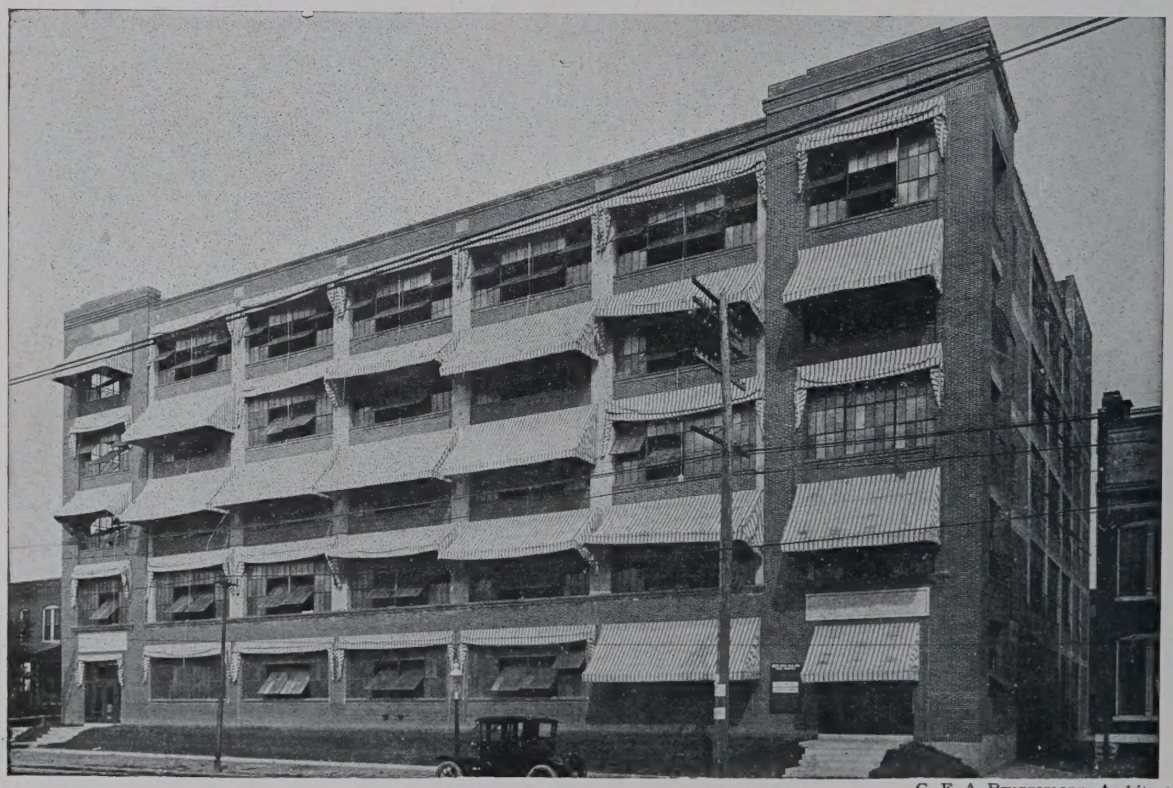
Albert Kahn, Architect
Ernest Wilby, Associate

Flanders Building, occupied by the Maxwell Motor Co., Detroit, Mich.

The second story windows are Economy Casements of United Steel Sash.
Building is constructed of the Kahn System Reinforced Concrete.



Muroran Roundhouse, Imperial Government Railways of Japan.
Windows of United Steel Sash, Kahn System Reinforced Concrete, Arched Hy-Rib Roof Slabs and Exterior Treated with Trus-Con Stone Tex.

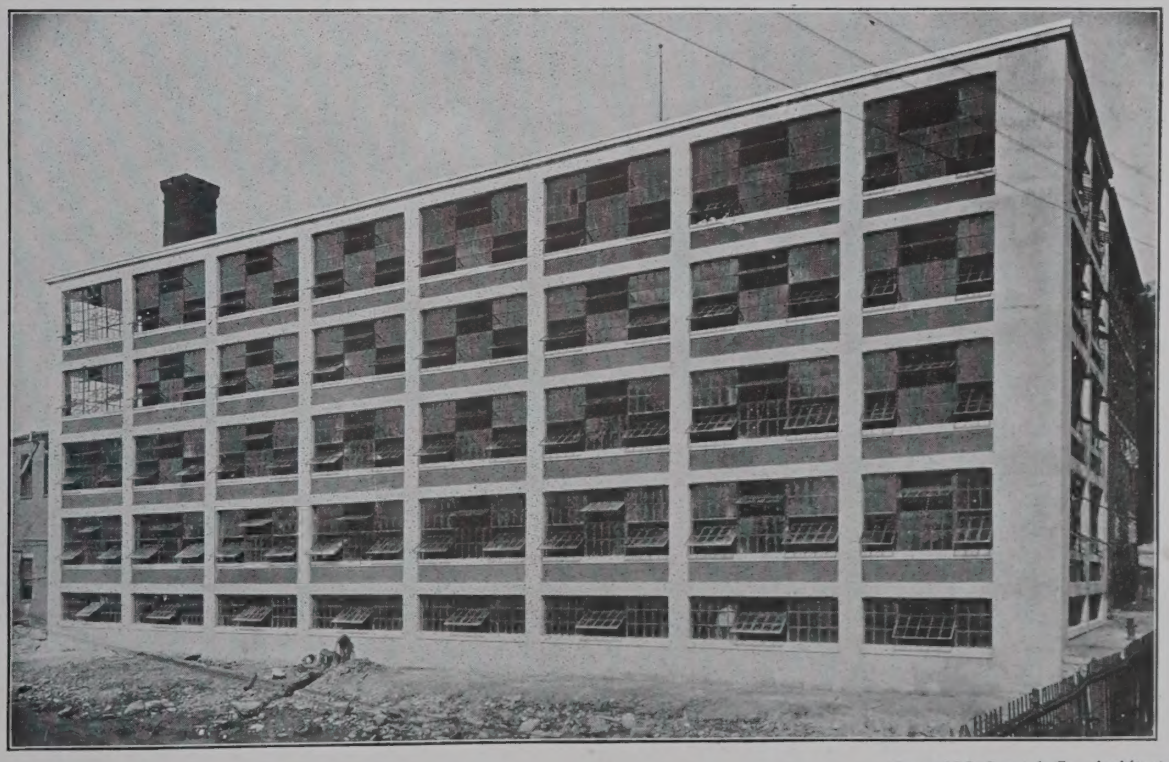


G. F. A. Bruggemann, Architect

Rice-Stix Dry Goods Company, St. Louis

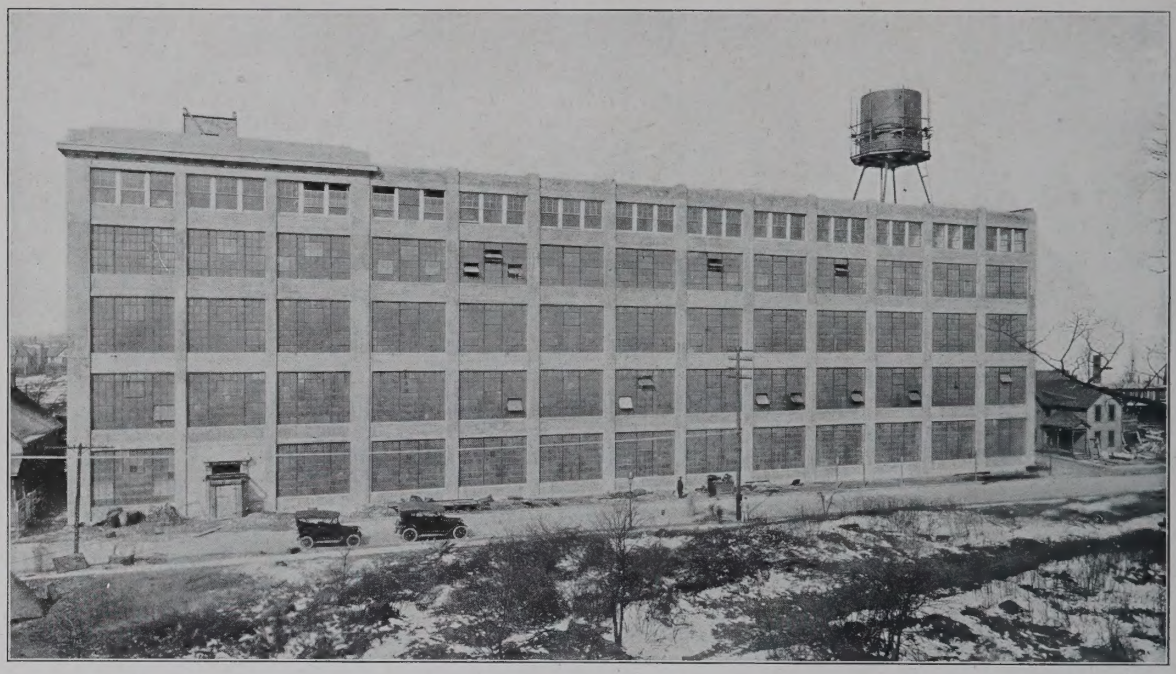
Windows have 66⅔ per cent ventilation, made possible by using United Steel Sash. Building is constructed according to the Kahn System Reinforced Concrete

Bates Manufacturing Co., Lewiston, Maine.
United Steel Sash used throughout side walls and sawtooth roofs of this modern fireproof plant constructed Kahn System of Reinforced Concrete.



Samuel M. Green & Co., Architects

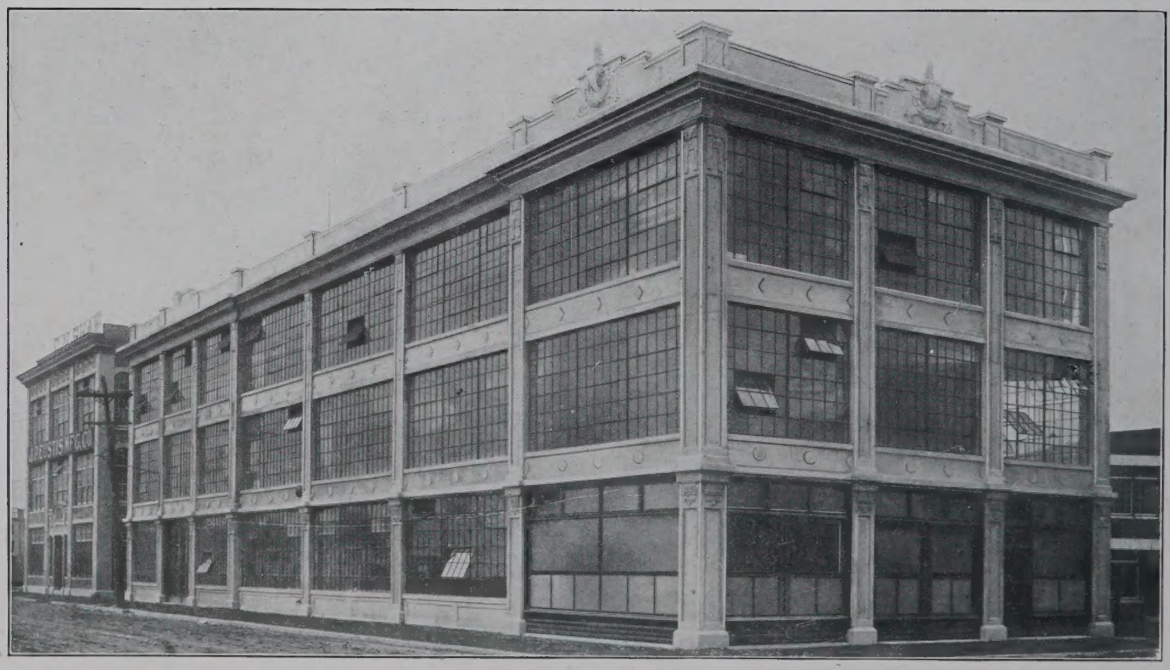
Florence Manufacturing Company, Florence, Mass.
Ample daylight and ventilation by the use of United Steel Sash for windows.



Crowell, Lindoff, Little Co., General Contractors

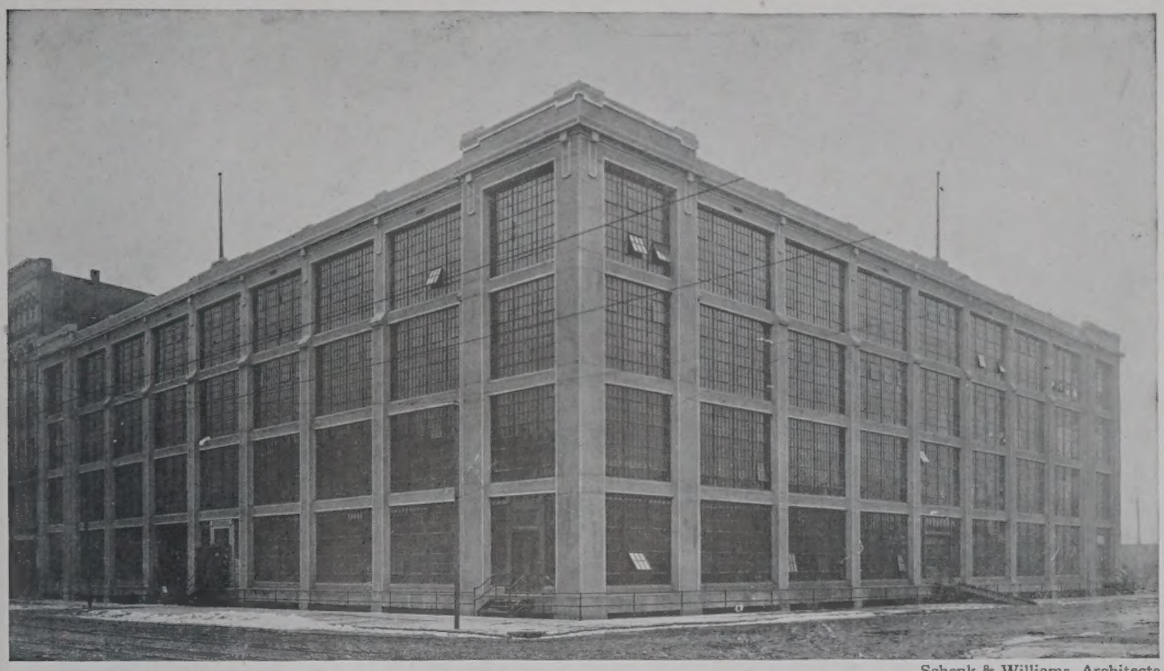
Christian, Schwarzenberg & Gaede, Engineers

Standard Welding Mfg. Co., Cleveland, Ohio
United Steel Sash used throughout.



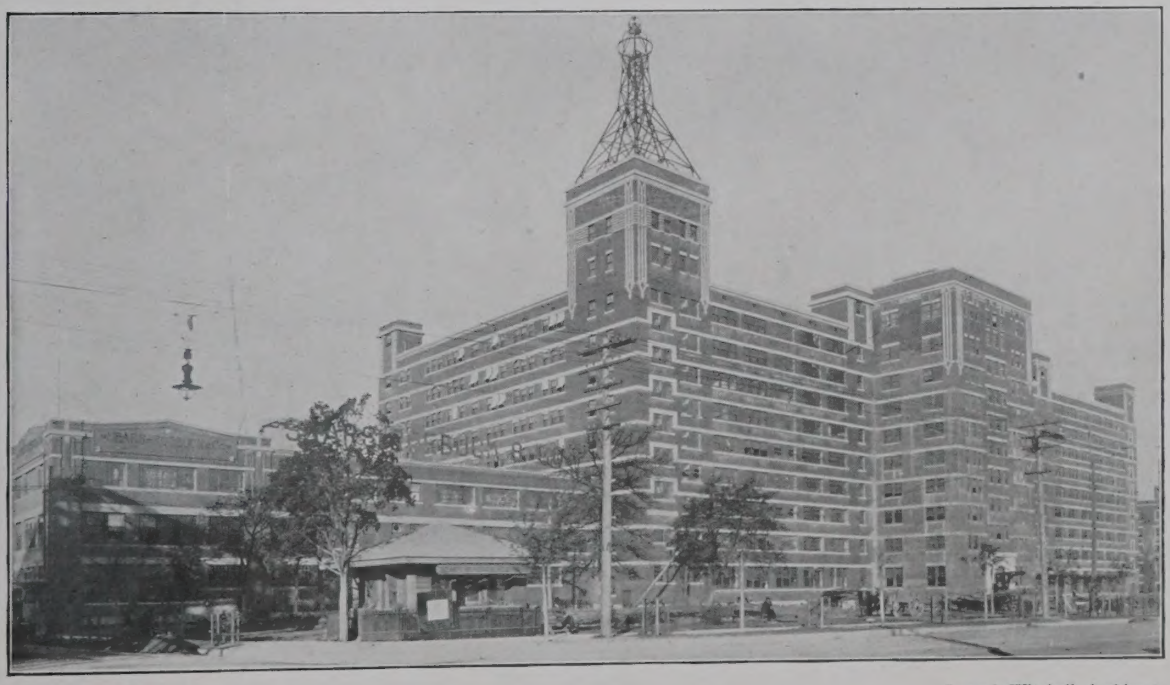
Monks & Johnson, Architects

Boston Talking Machine Co., Cambridge, Mass.
Maximum daylight for Interiors by use of United Steel Sash for Windows.



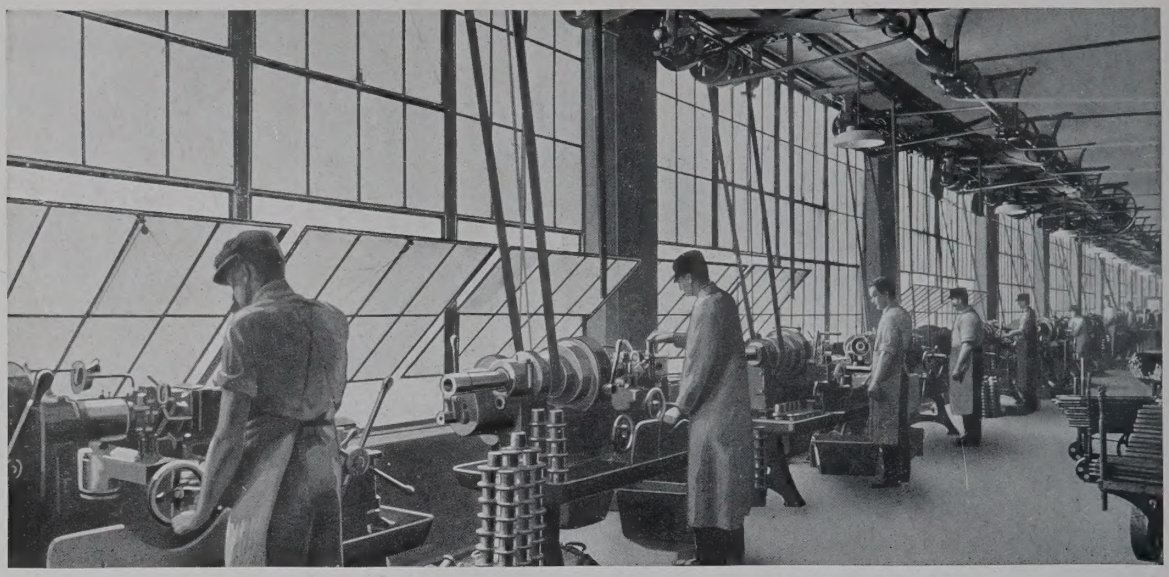
Schenk & Williams, Architects

Beaver Power Building, Dayton, Ohio.
United Steel Sash used throughout.

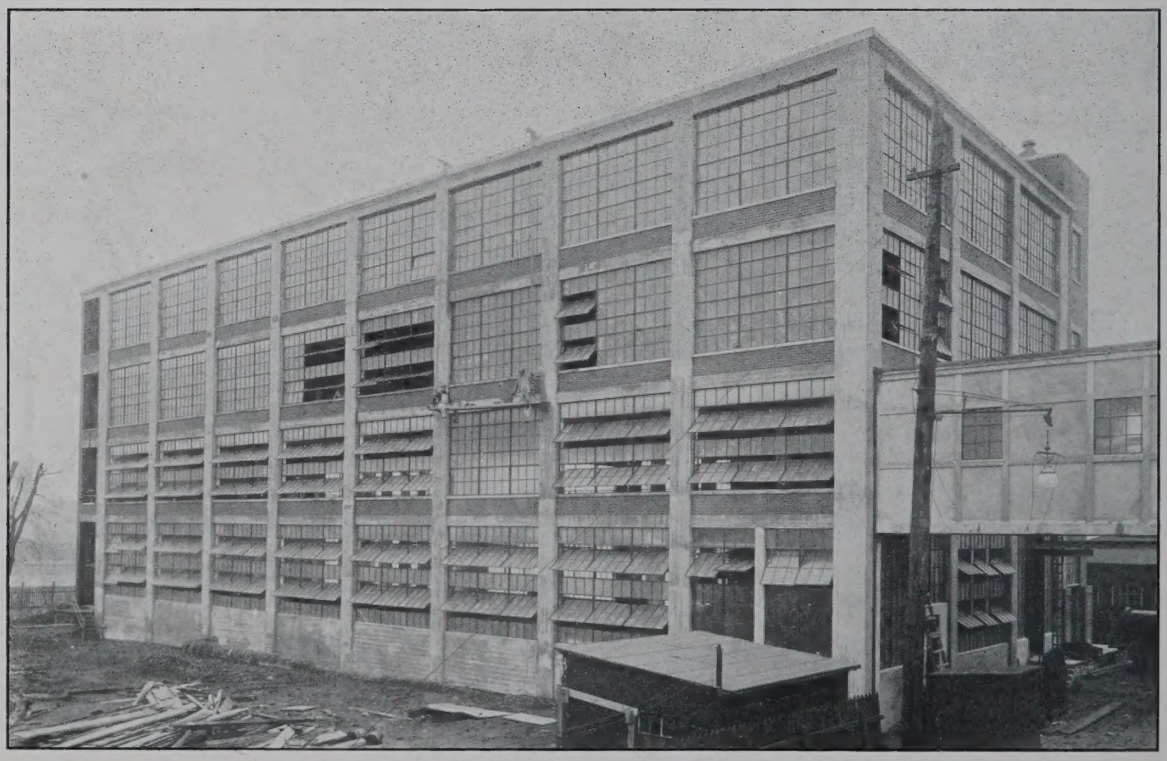


Lang & Witchell, Architects

Sears, Roebuck & Company, Dallas, Texas
Windows of United Steel Sash.

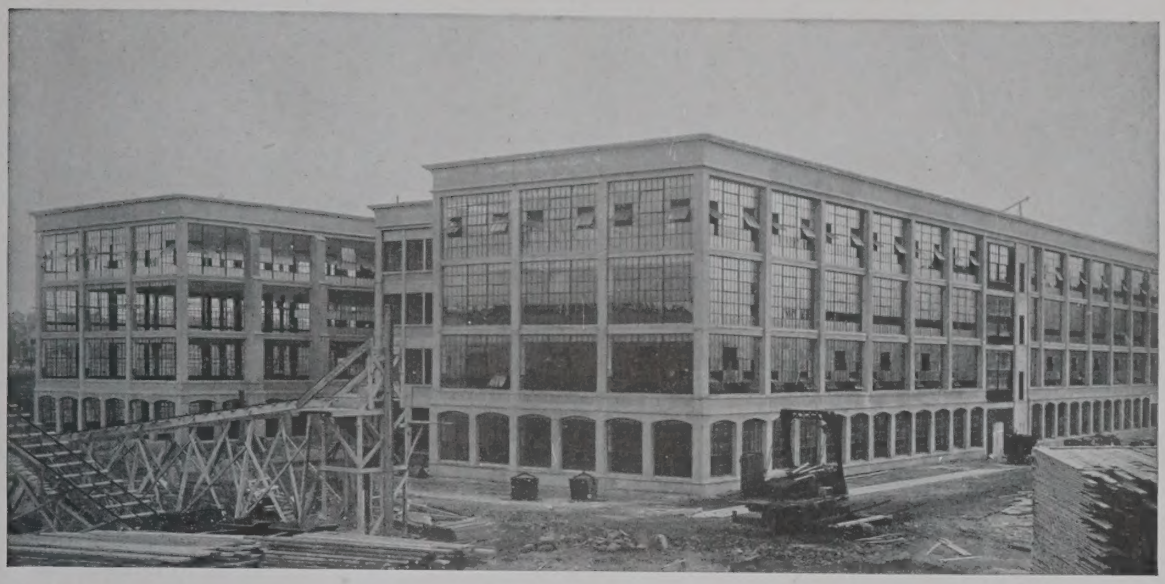


Dodge Bros. Plant, Detroit, Mich.
Equipped with over 100,000 square feet of United Steel Sash.



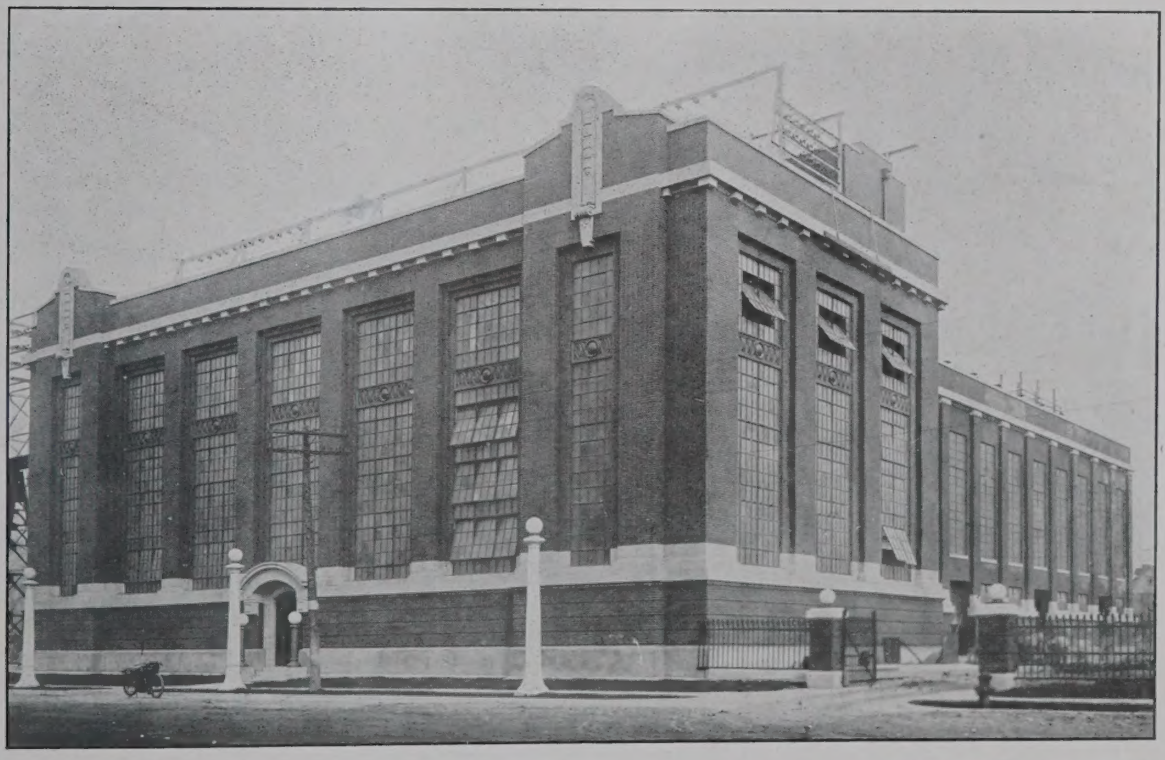
Ballinger & Perrot, Architects

Quaker City Rubber Co., Philadelphia.
Note large ventilators of United Steel Sash.



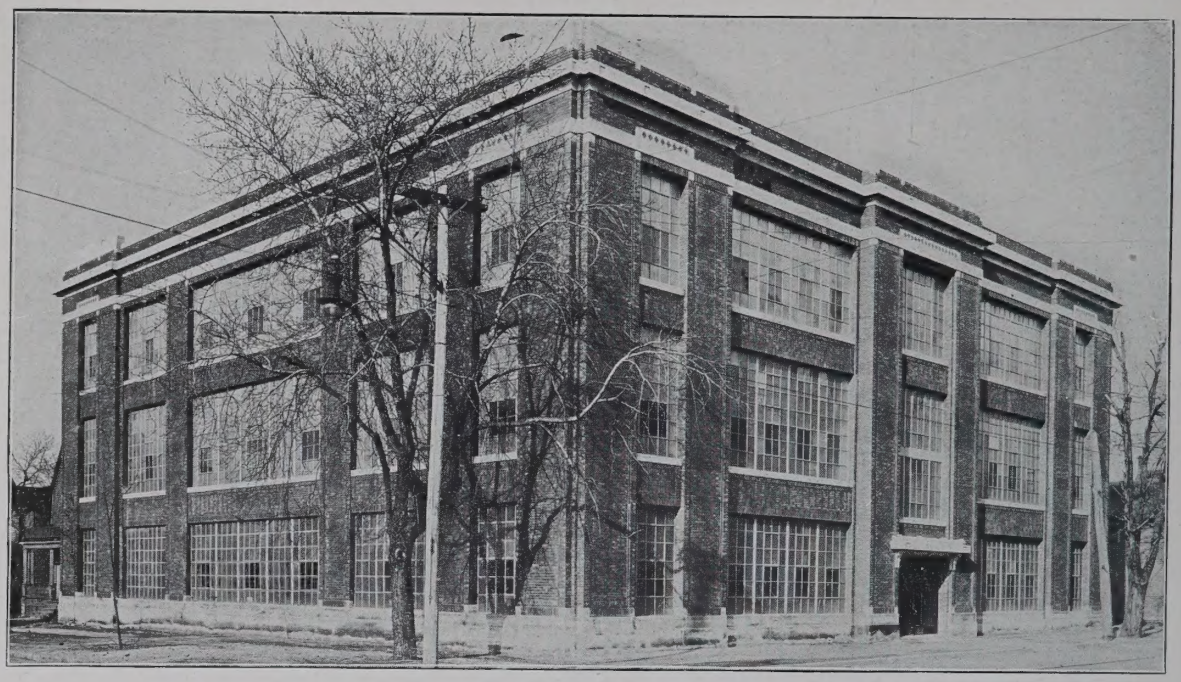
E. L. Ransome, Engineer

United Shoe Machinery Co., Beverly, Mass.
Entire building equipped with United Steel Sash.



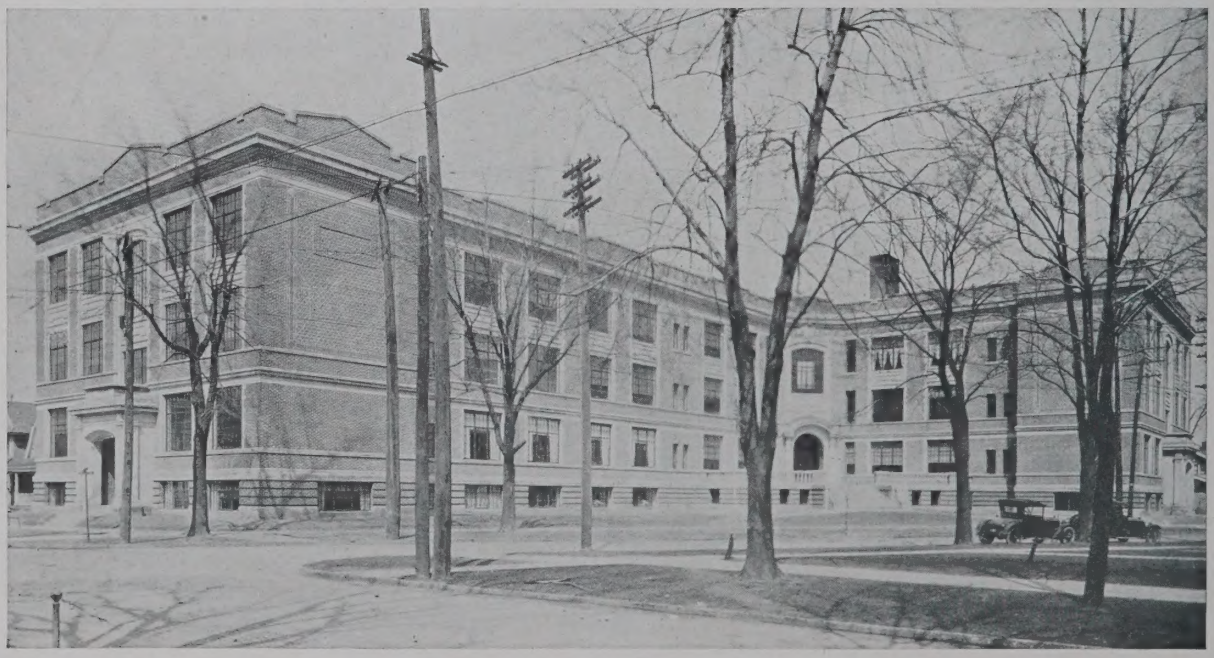
Klipstein & Rathmann, Architects

Mississippi River Power Distributing Co., St. Louis, Missouri.
Large windows and ventilators of United Steel Sash mechanically operated.



O. Z. Cervine, Architect

Manual Training School, Rock Island, Ill.
United Steel Sash for all windows.



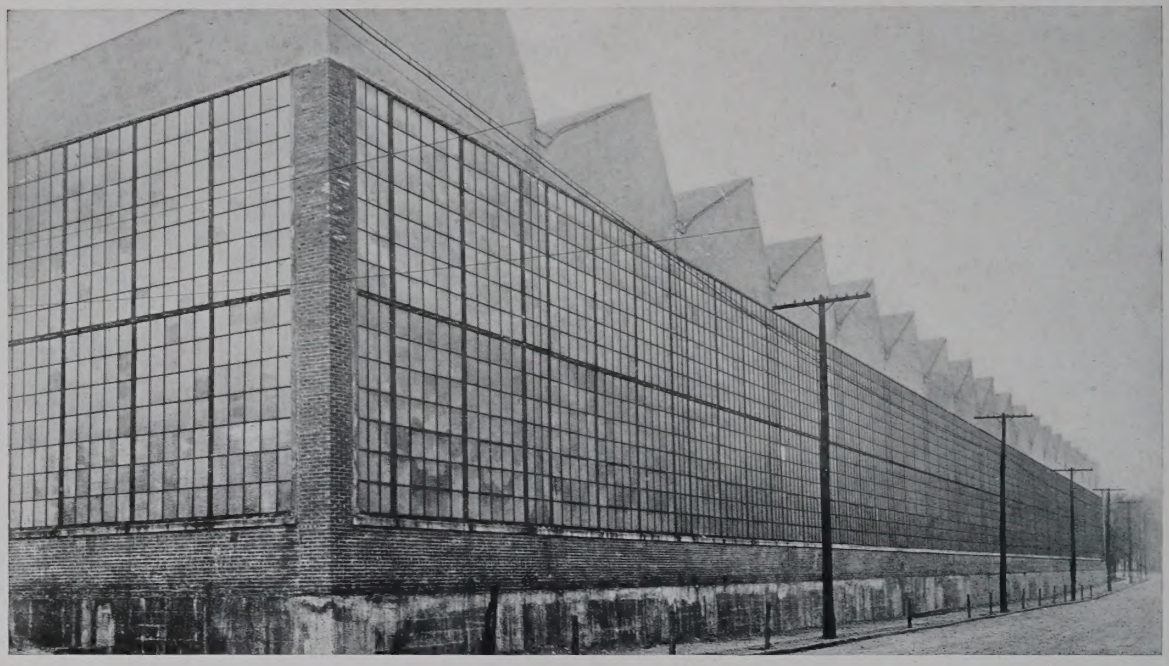
Edwin M. Gee, Architect

Lincoln School, Toledo, Ohio
A modern fireproof structure with windows of United Steel Sash.

Assembling Building of Ford Motor Co., Cambridge, Mass.
Modern Fireproof Building with United Steel Sash Windows.

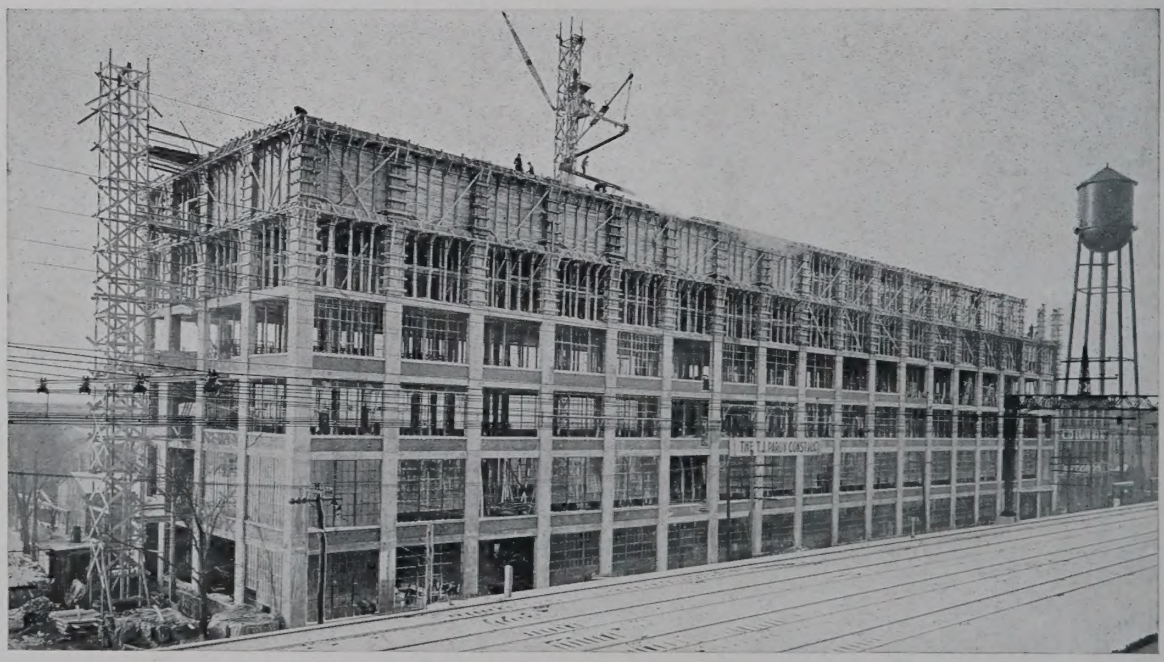
J. L. Weiss, Architect

Dorris Motor Car Co., St. Louis, Mo.
100% ventilation with large ventilators of United Steel Sash.

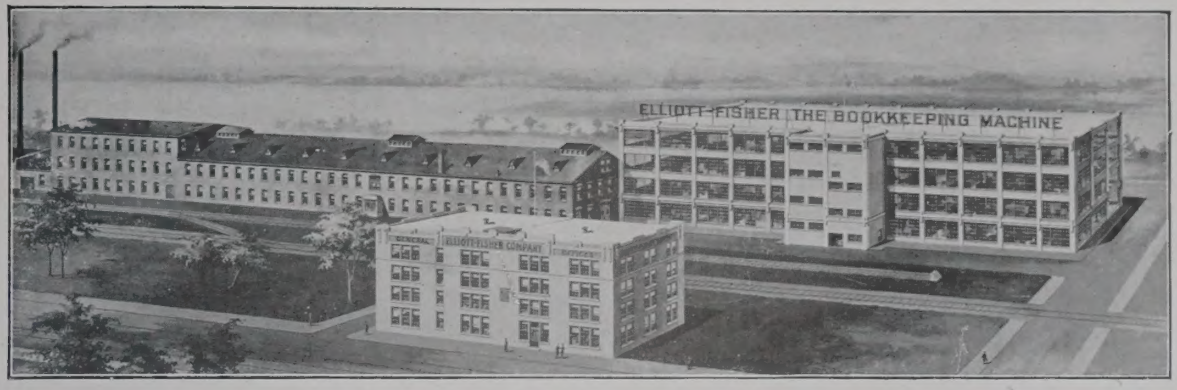


T. J. Pardy Const. Co., Contractor

Jones and Laughlin Steel Co., Pittsburgh, Pa.
Entire Walls of United Steel Sash



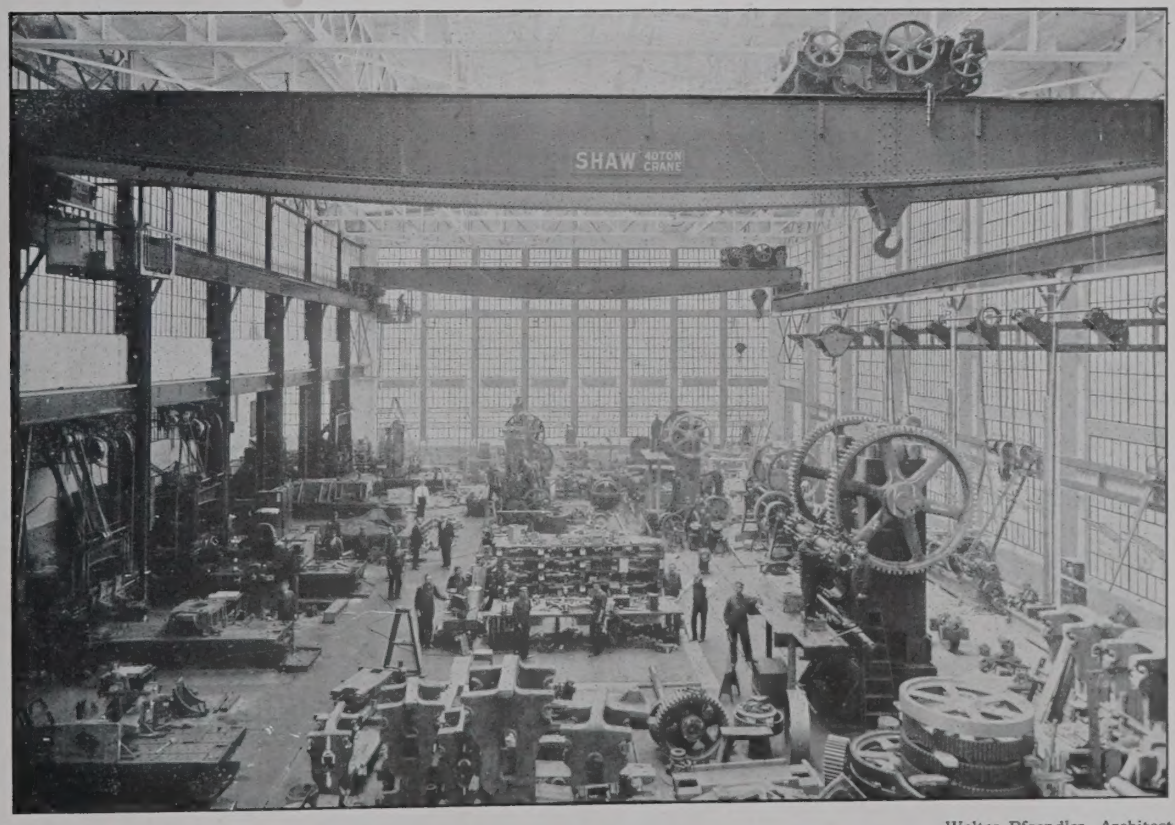
American Graphophone Co., Bridgeport, Conn.
United Steel Sash used throughout



The Elliott-Fisher Company, Harrisburg, Pa.

Daylighted with United Steel Sash and constructed with the Kahn System of Reinforced Concrete

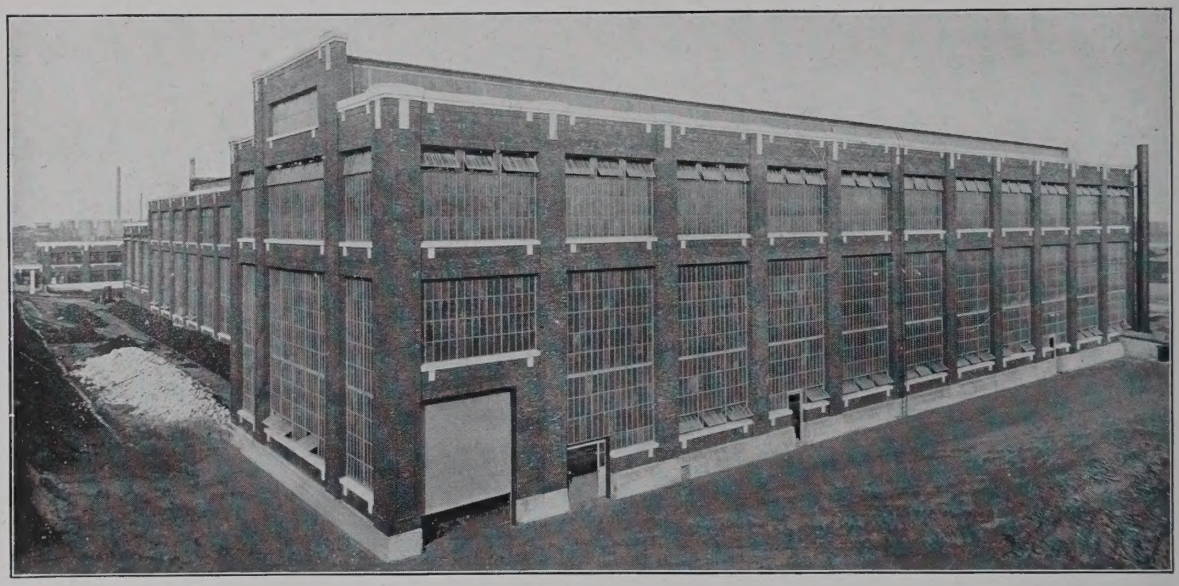
A remarkable illustration showing the contrast between the modern daylight, fireproof building at the right and the old-style, poorly lighted, mill construction at the left. In which of these buildings would you find the largest output, the best quality of workmanship, the greatest economy of floor space and the most efficient workmen?



Walter Pfaendler, Architect

Erecting Shop, E. W. Bliss Company, Brooklyn, New York.

All windows are of United Steel Sash.



The Arnold Co., Engineers

Busch-Sulzer Bros.—Diesel Engine Company, St. Louis, Mo.

In this most modern plant are built Diesel Engines, which require highest class workmanship.
Perfect daylighting afforded by windows of United Steel Sash

Albert Kahn, Architect
Ernest Wilby, Associate

Power House, Morgan & Wright Co., Detroit, Mich.

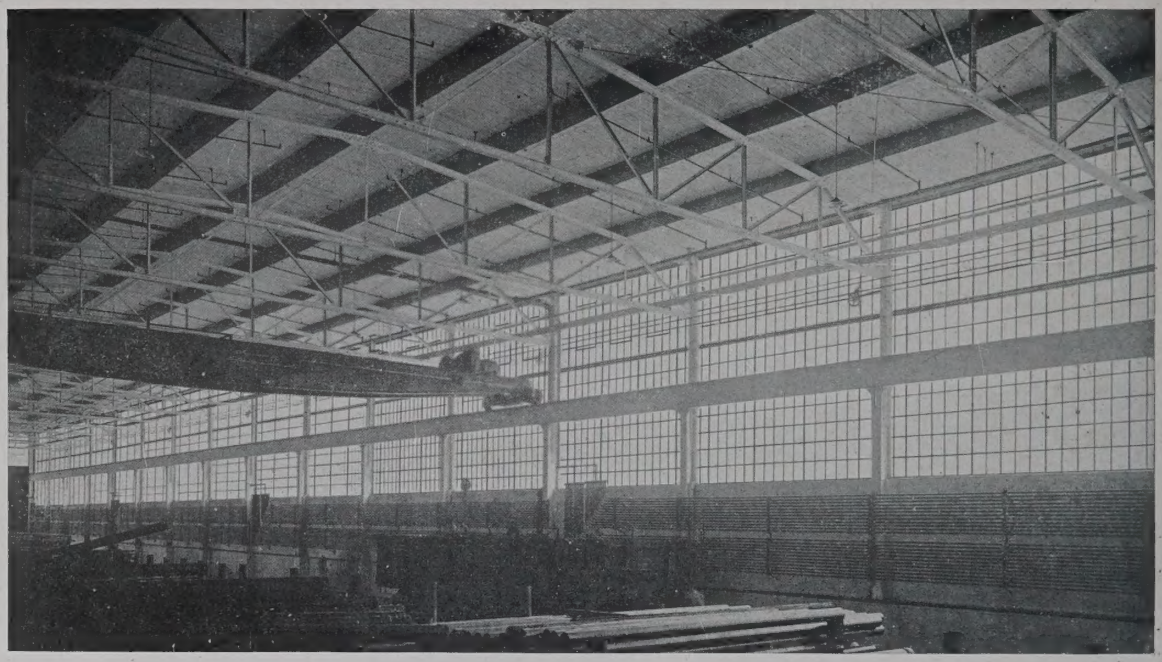
Vertically Pivoted United Steel Sash with Curved Head.
One of several buildings equipped with United Steel Sash.

W. F. Barlow, Architect

L. Q. White Shoe Company, Bridgewater, Mass.
A large installation of United Steel Sash.

G. R. Wadliegh, Architect

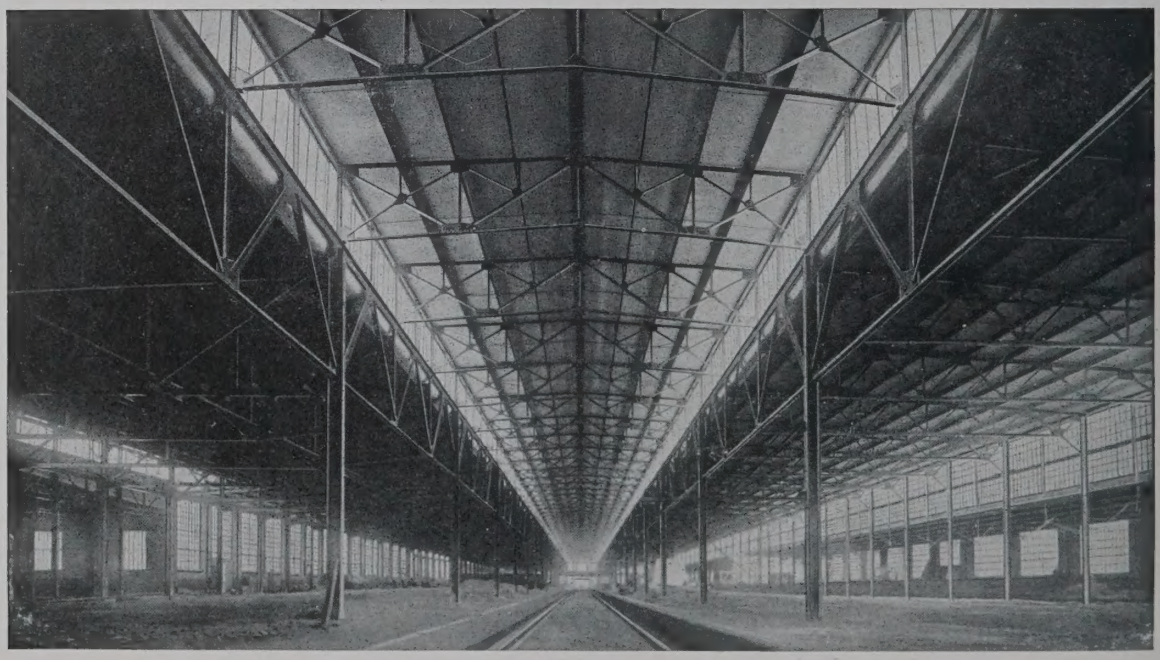
Texas Bag and Fibre Co., Houston, Texas.
Pivoted United Steel Sash for all windows.



The W. E. Wood Co., Engineers and Contractors

General Fire Extinguisher Co., Warren, Ohio.

Note that United Steel Sash are outside of wall columns and extend in an unbroken line for the entire length of building.



DeVore-McGormley Co., Engineers

Edward Ford Plate Glass Co., Rossford, Ohio.

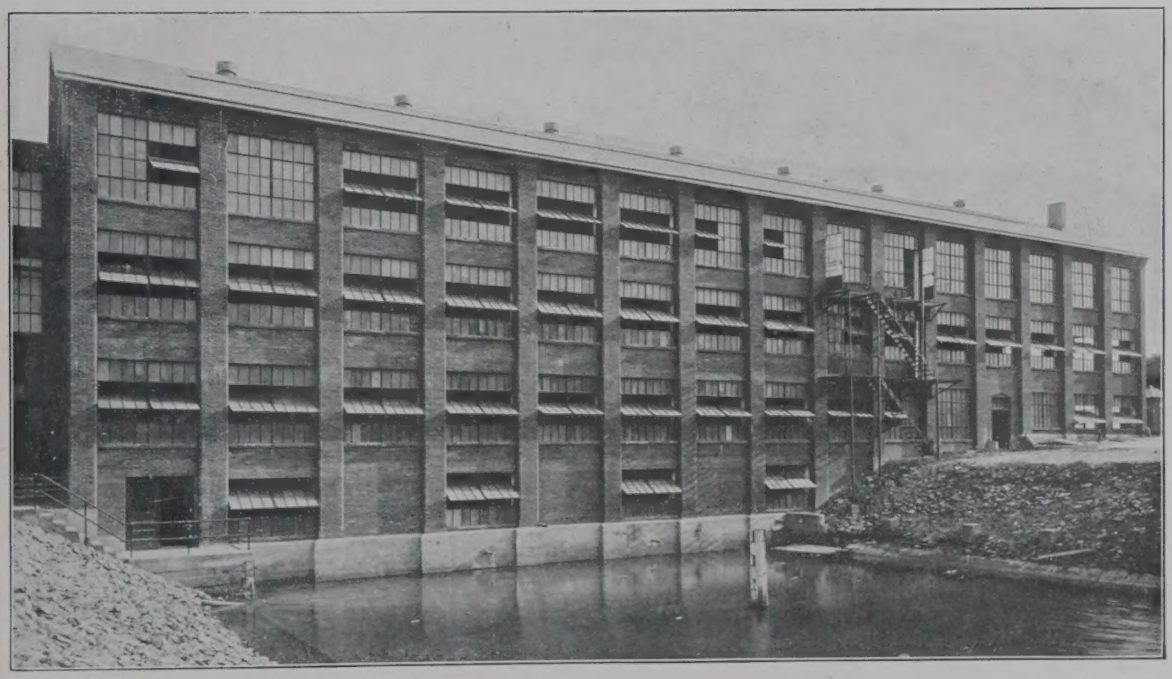
Over 70,000 sq. ft. of United Steel Sash used in side-walls, monitors and sawtooth roofs.
Over 1,000,000 sq. ft. of Hy-Rib used in this plant.

Designed by Owner

Beachnut Packing Co., Canajoharie, N. Y.

Practically this entire plant is built Kahn System of Reinforced Concrete and equipped with United Steel Sash

Note perfect daylighting of interior in this modern sanitary plant.



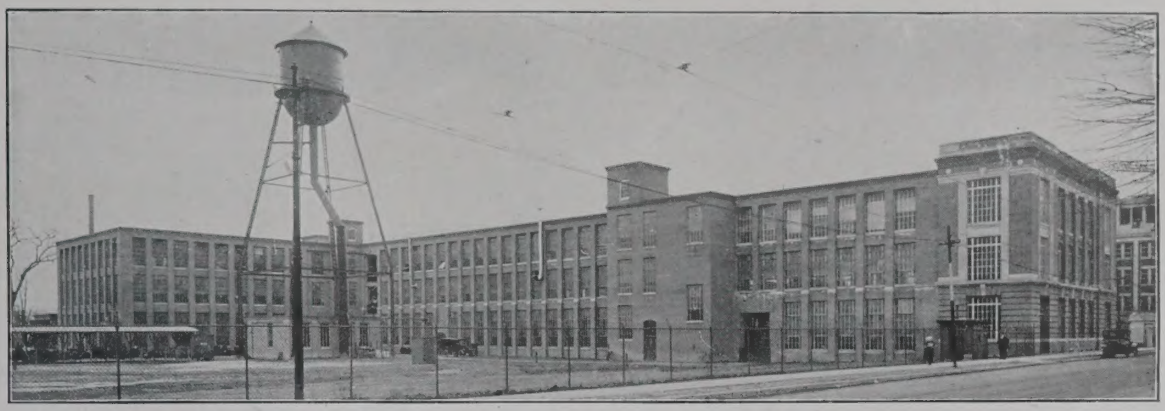
Designed by Owners

Building No. 28, Eastman Kodak Co., Rochester, N. Y.

United Steel Sash for windows

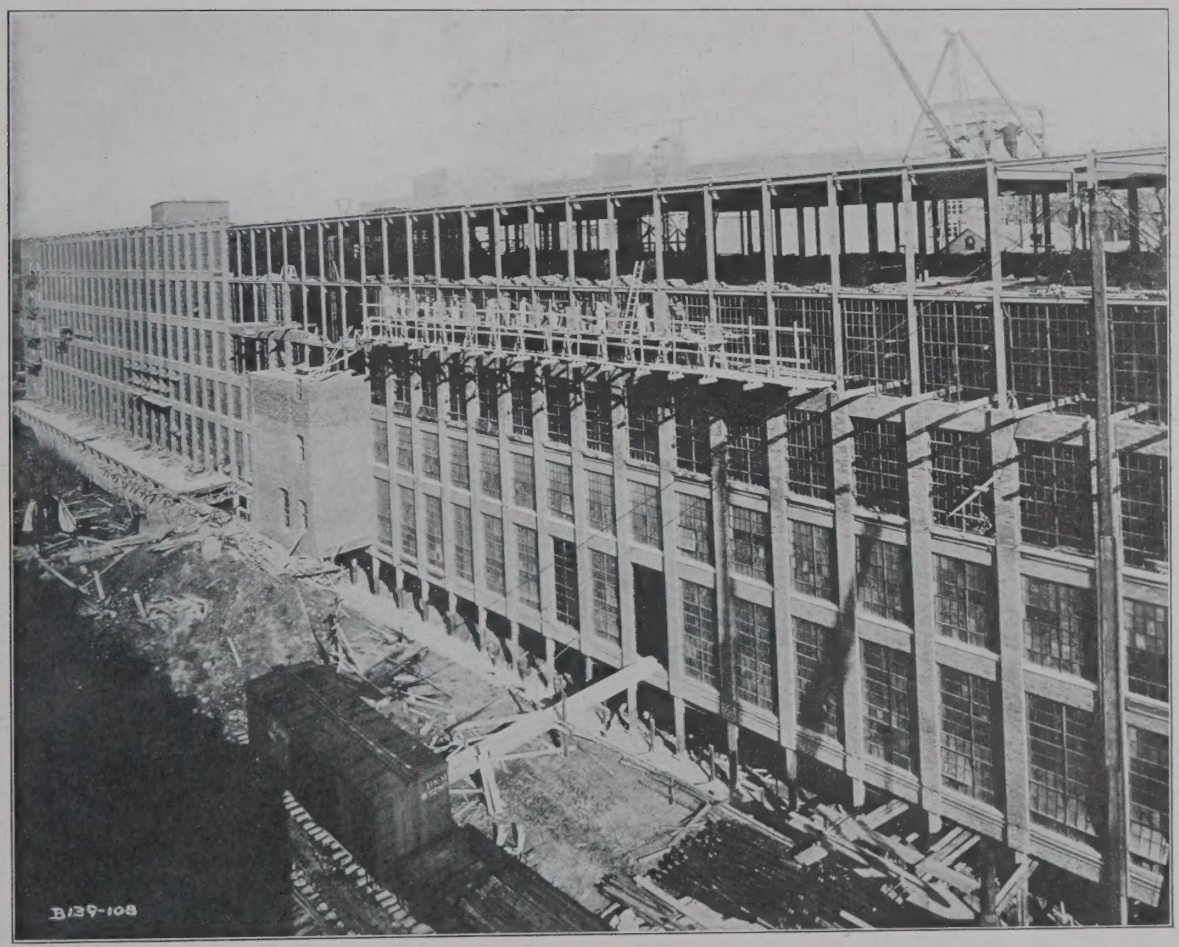
Factory for Henry R. Schoch (Broad Street Top Co.), Philadelphia, Pa.
All windows of United Steel Sash—Fireproof Construction of Kahn System Reinforced Concrete.

Penn Central Building—Pennsylvania R. R., Altoona, Pa.
Kahn System of Reinforced Concrete throughout. United Steel Sash for all windows.



Samuel M. Green Co., Architects and Engineers

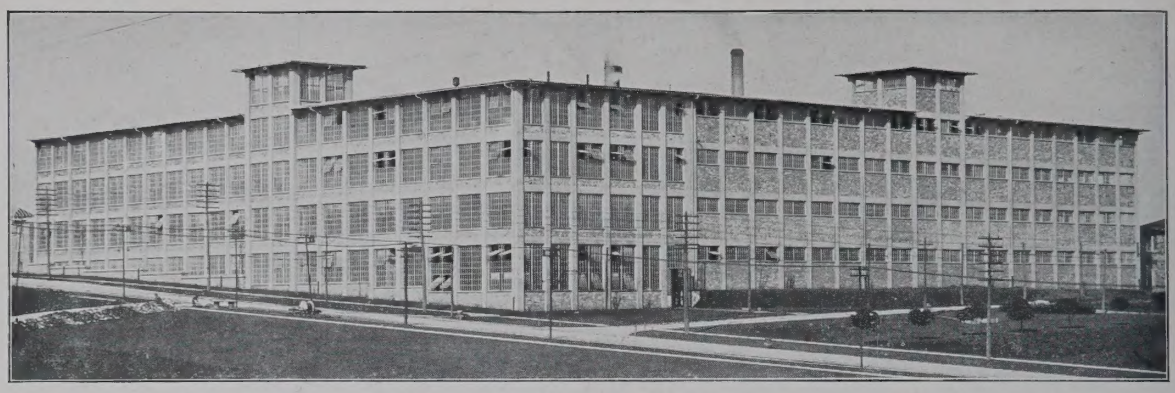
National Equipment Co., Springfield, Mass.
All windows of United Steel Sash.



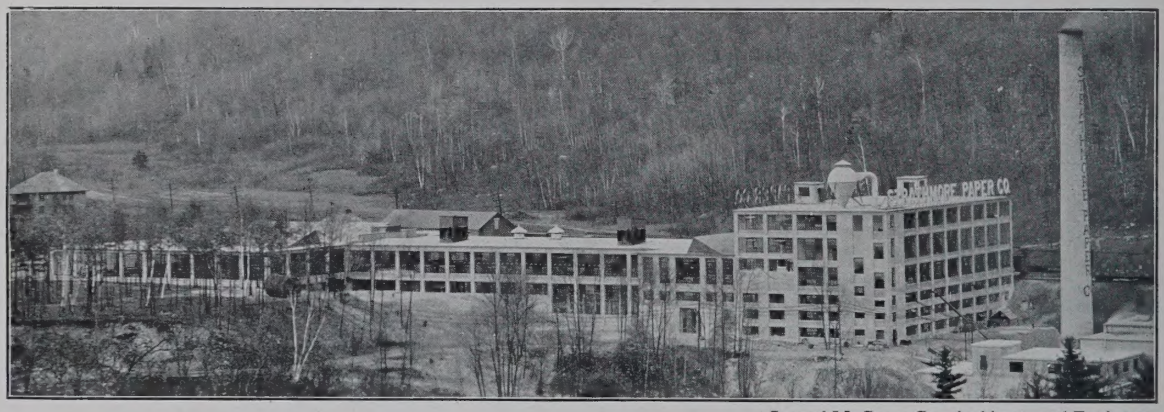
Fred T. Ley & Co., Contractors

Geo. V. Allen, Architect

Fisk Rubber Co. Plant, Chickopee, Mass.
66,000 sq. ft. of United Steel Sash used for this daylighted factory.

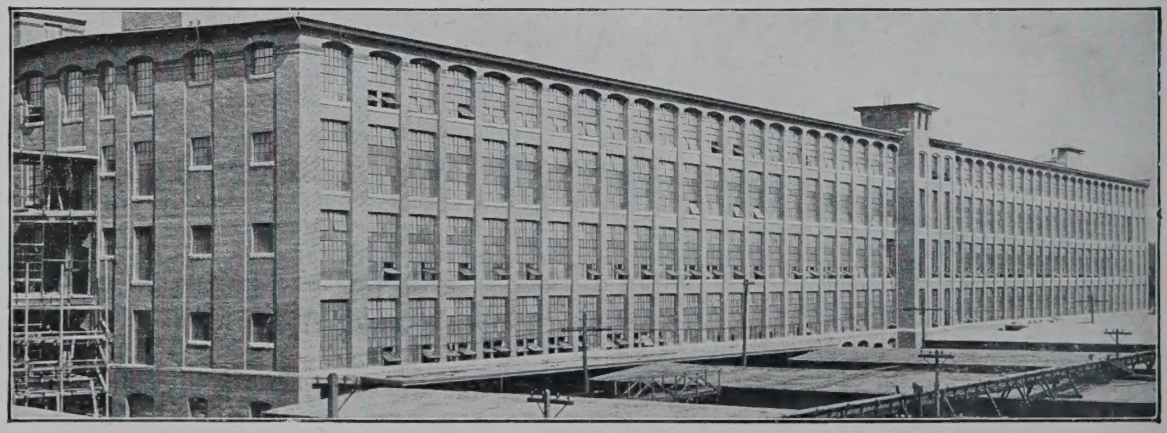


Hershey Chocolate Co., Hershey, Pa.
All the recent buildings of this modern fireproof plant are daylighted with United Steel Sash and built Kahn System Reinforced concrete.



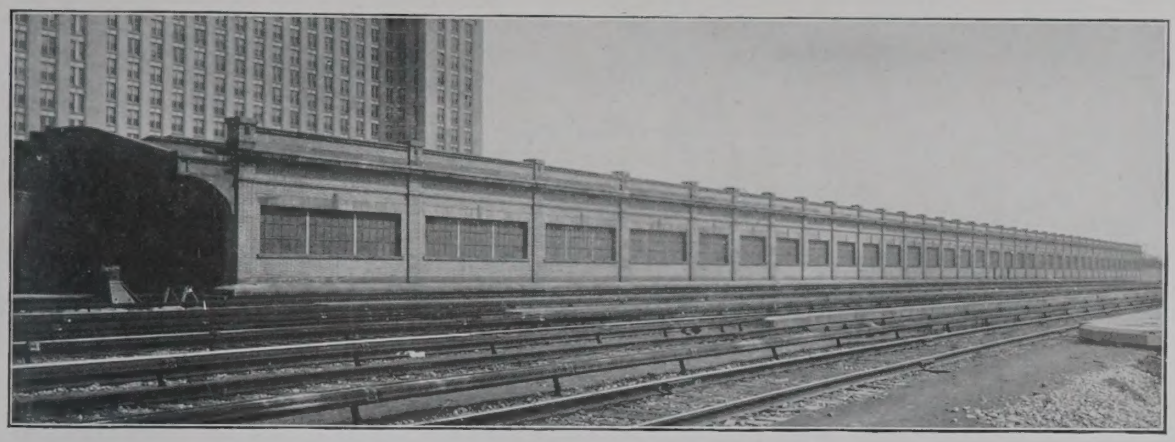
Samuel M. Green Co., Architects and Engineers

Strathmore Paper Co., Woronoco, Mass.
Immense window area of United Steel Sash.



C. T. Main, Engineer

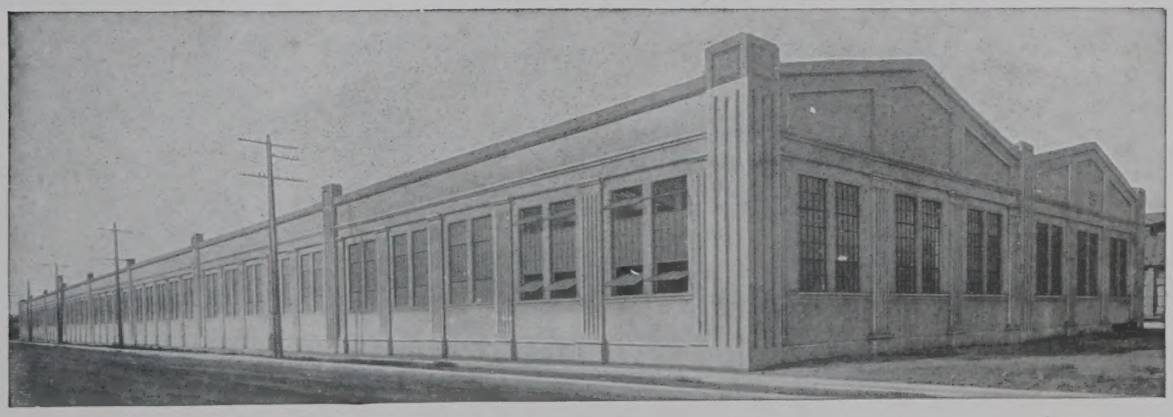
Ludlow Mill No. 11, Ludlow, Mass.
Maximum area of United Steel Sash makes interior as bright as day.



George A. Fuller Co. Contractors — George H. Webb, Chief Engineer

Michigan Central Railway Station, Detroit, Michigan.

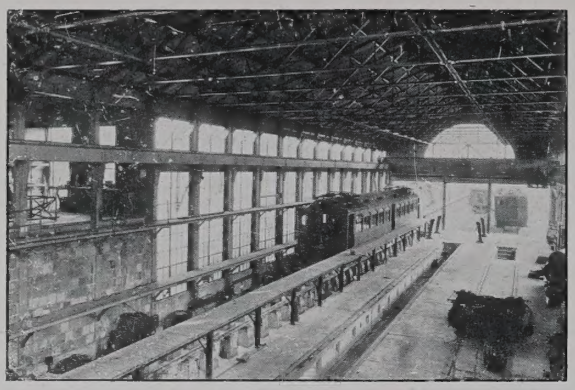
United Steel Sash was used throughout Train Sheds (upper photograph), Street Car Shelter (lower photograph), Express Building and Service Building.



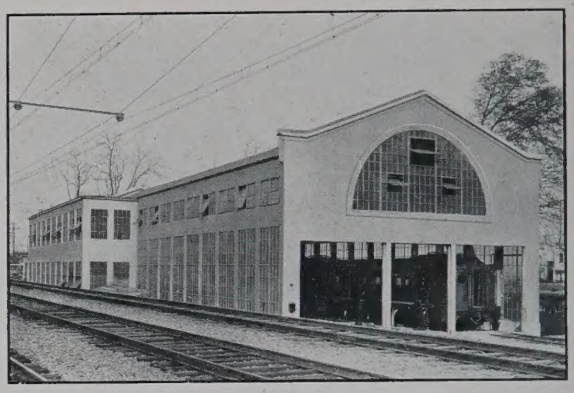
George Kuhrts, Chief Engineer

Paint Shop, Los Angeles Railway Co., Los Angeles, Cal.

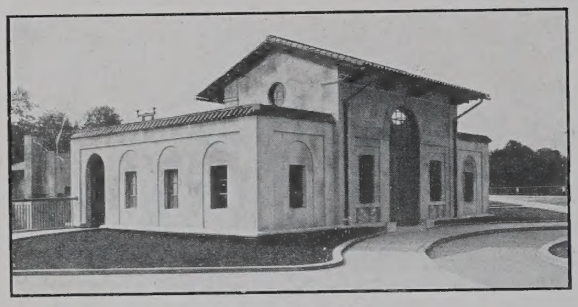
United Steel Sash and Kahn System of Reinforced Concrete used throughout.



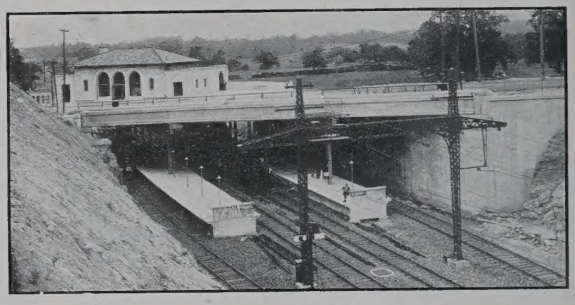
Interior 180th Street Shops



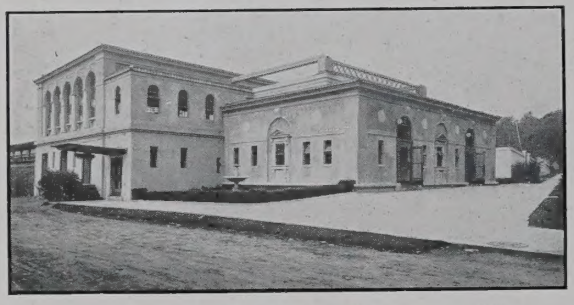
Exterior 180th Street Shops—Hy-Rib Concrete Walls



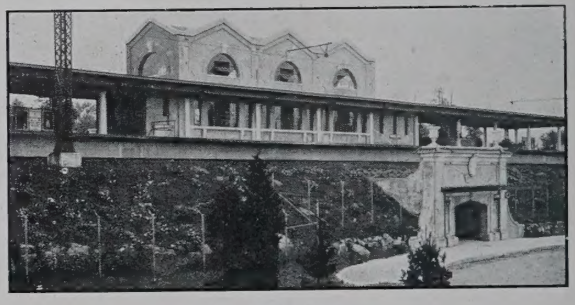
Wykagyl Station



Wykagyl Station

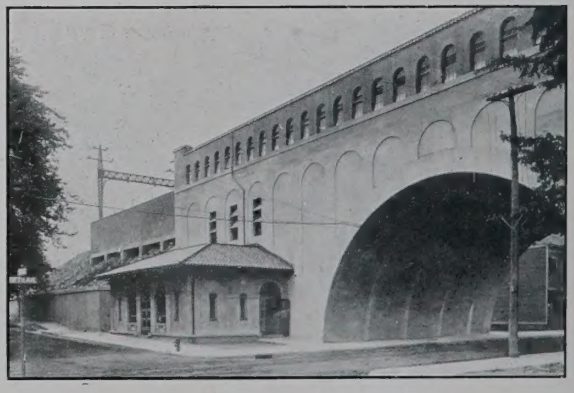


White Plain Station



Quaker Ridge Station

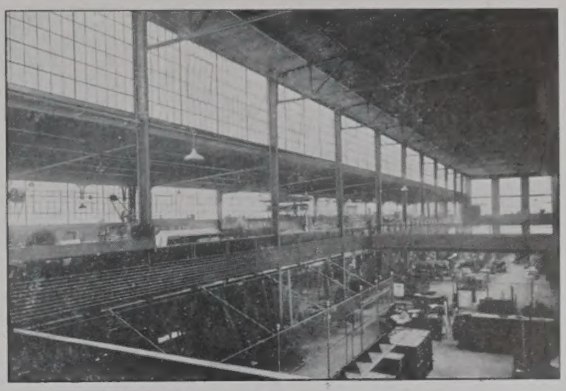
180th Street Station



Fifth Avenue Station

Stem and Fellheimer, Architects

New York, Westchester & Boston Railway used United Steel Sash in the windows of all these fine buildings



Haynes Automobile Co., Kokomo, Ind.
United Steel Sash used throughout in side walls and monitors.

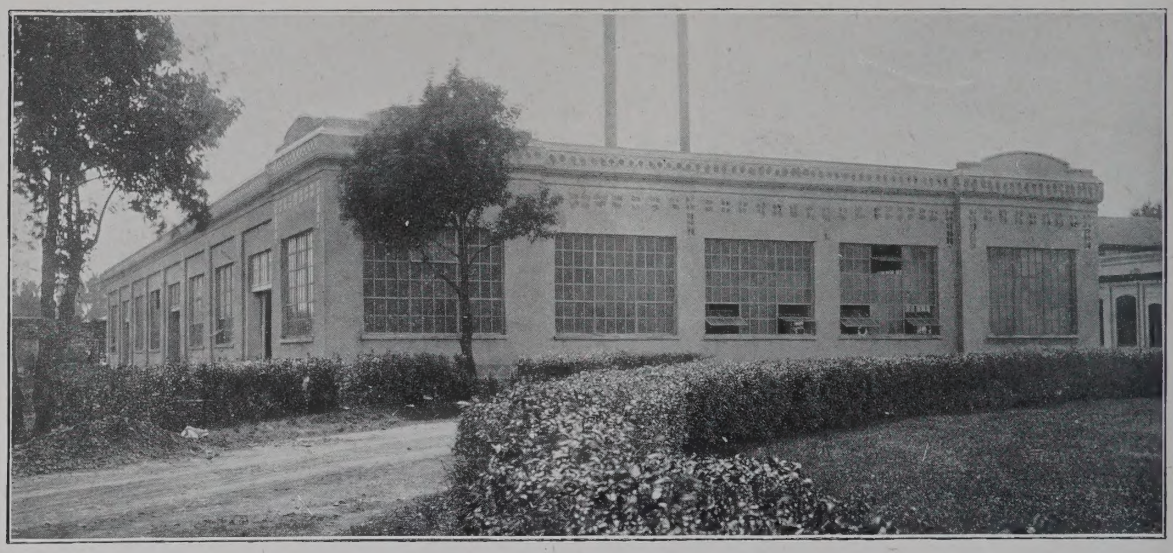
Standard Furniture Co., Herkimer, N. Y.
United Steel Sash for windows. Flat ceilings of Kahn System Reinforced Concrete.

Turner Construction Co., Contractors

Hyatt Roller Bearing Co., Harrison, N. J.
Large ventilators of United Steel Sash

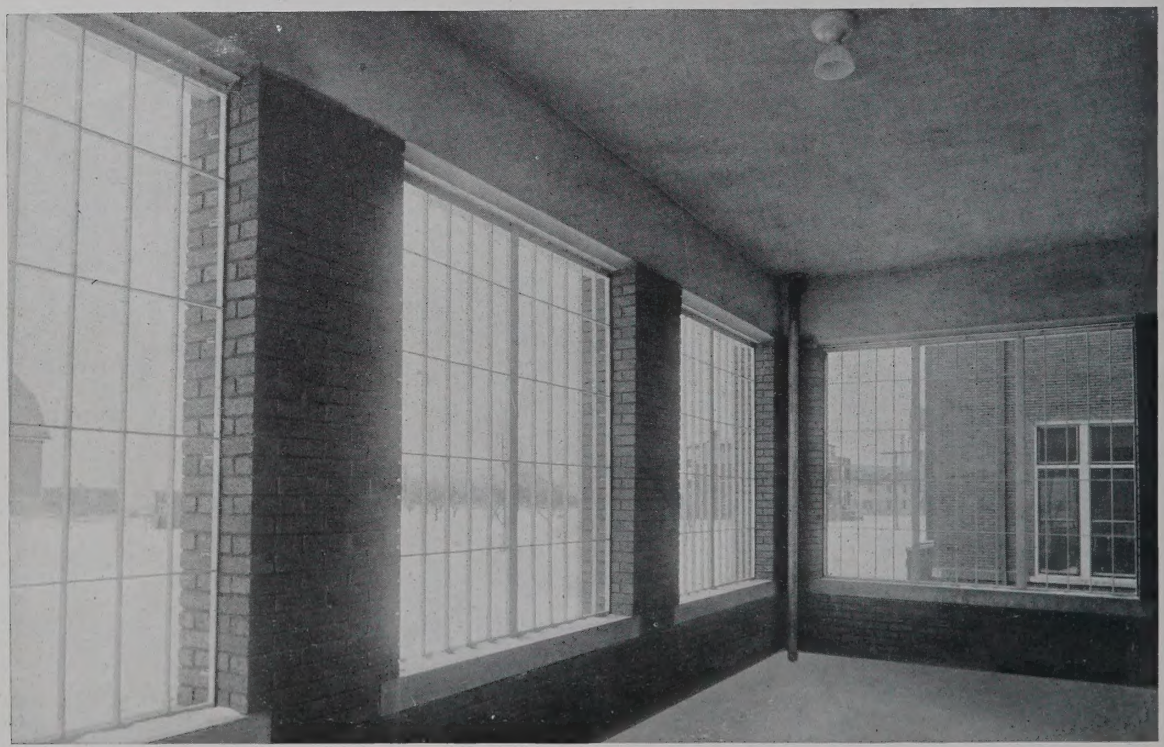
Coombs Bros., Architects

Bates Street Shirt Co., Lewiston, Maine.
Large expanse of windows of United Steel Sash.



A. H. Stem, Architect

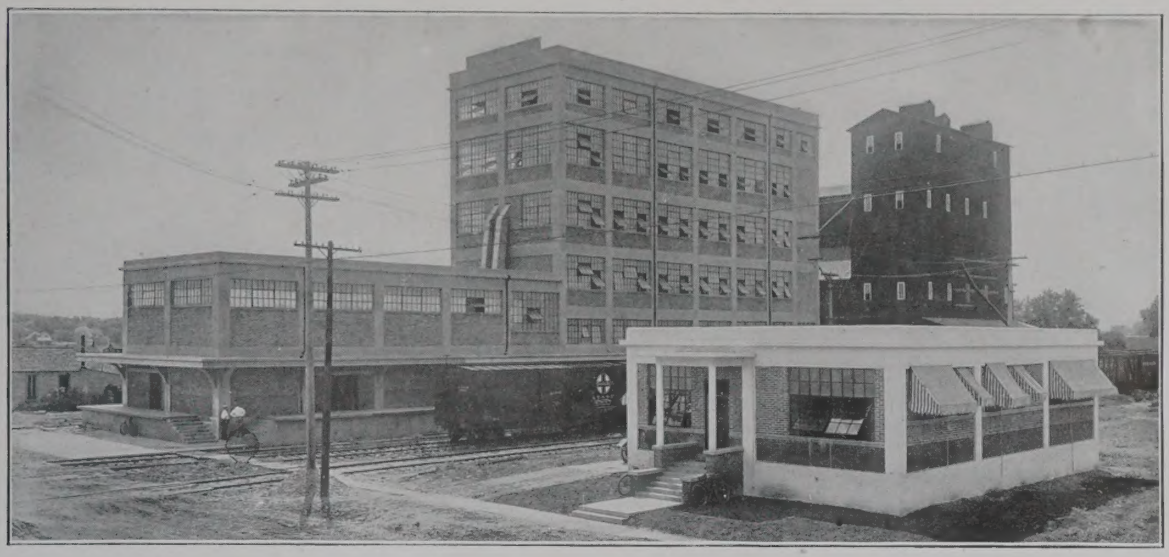
White Enamel Refrigerating Co., St. Paul, Minn.
Windows of United Steel Sash.



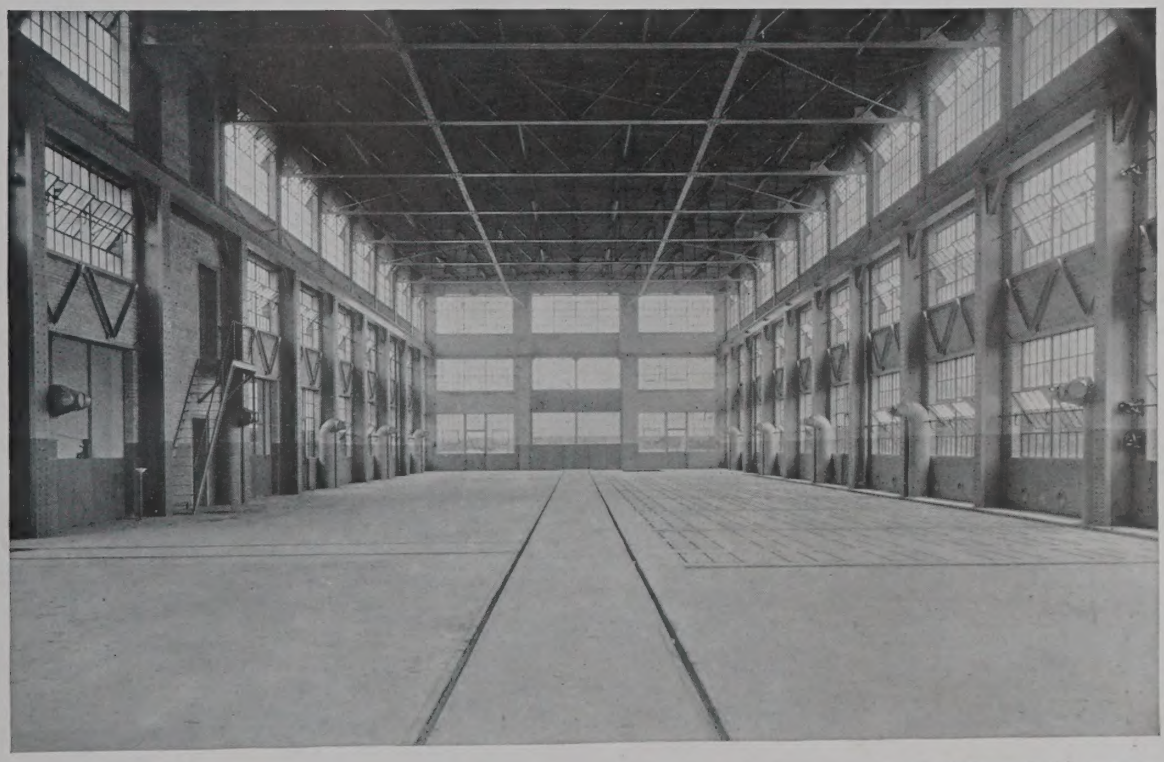
A. J. Smith Construction Co., Contractors

Baxter, O'Dell & Halpin, Architects

Women's Hospital, Eloise, Mich.
A special design combining Pivoted and Sliding United Steel Sash



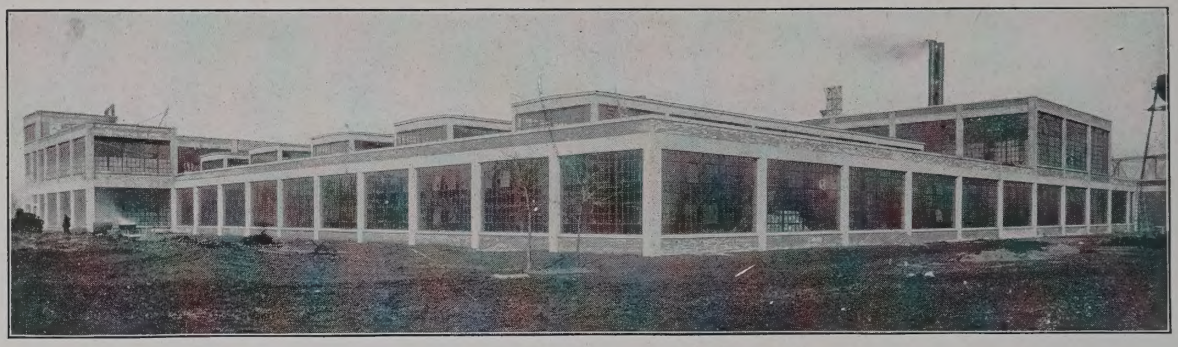
Flour Mills of Wichita Flour Mills Co., Wichita, Kansas.
Windows of United Steel Sash—Kahn System Reinforced Concrete, Skeleton Frame Construction.



Henry Van Der Horst, Contractor

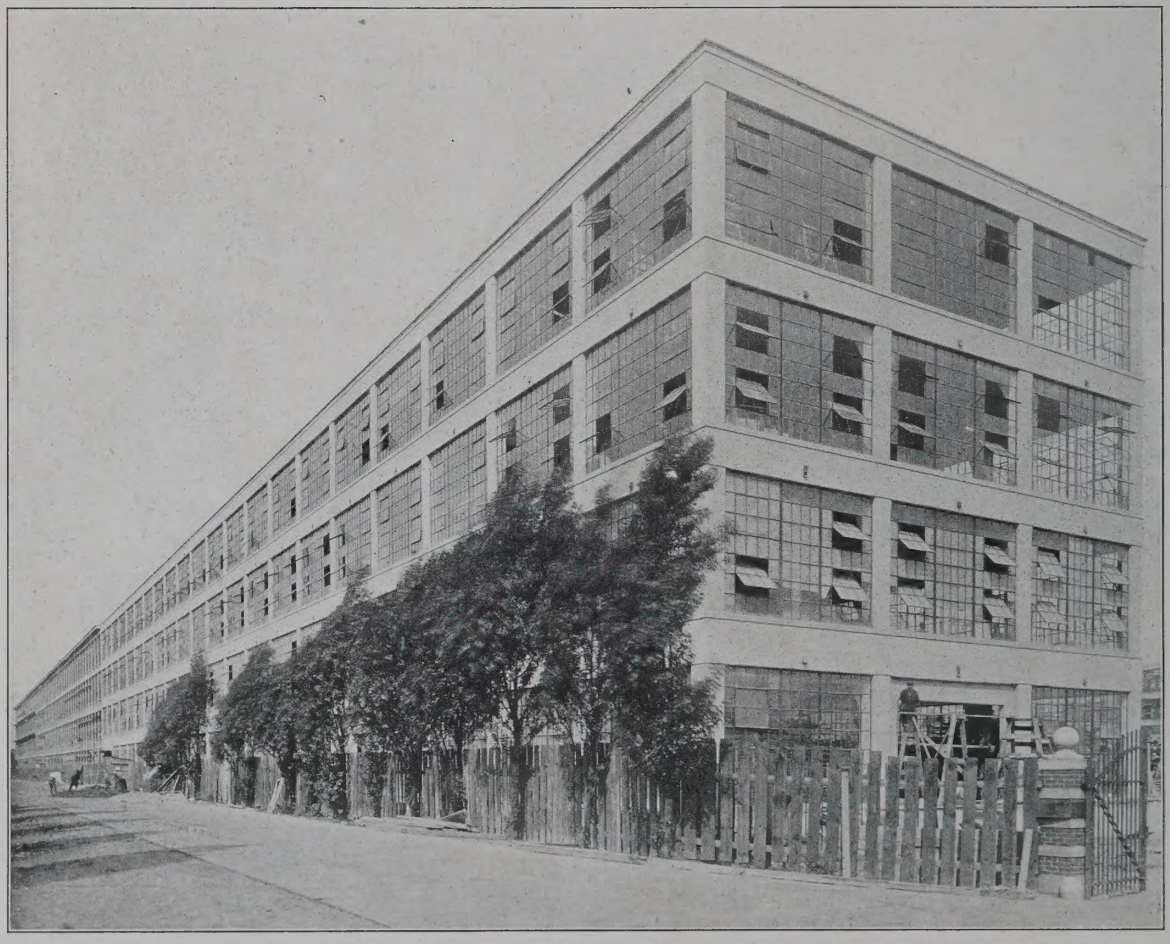
Lockwood, Greene & Co., Architects

Engine Erecting Shop of The Shefflield Car Co., Three Rivers, Mich.
Interior perfectly daylighted and ventilated by United Steel Sash



Lockwood, Greene & Co., Architects and Engineers

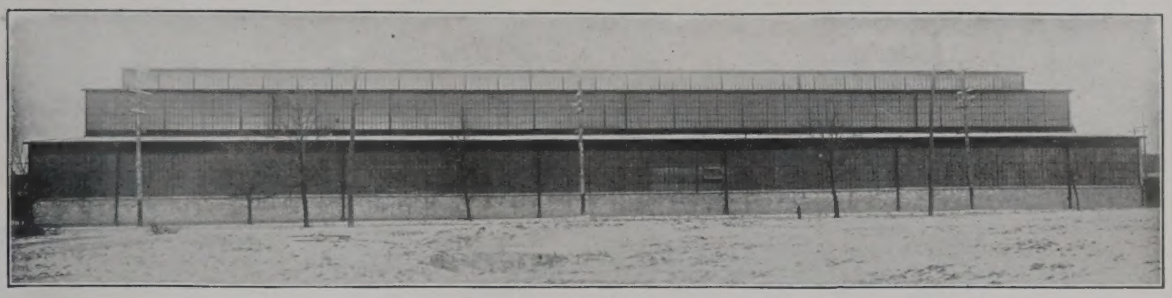
Prest-O-Lite Manufacturing Co., Indianapolis, Ind.
Note perfect daylighting with wide expanse of United Steel Sash Windows.



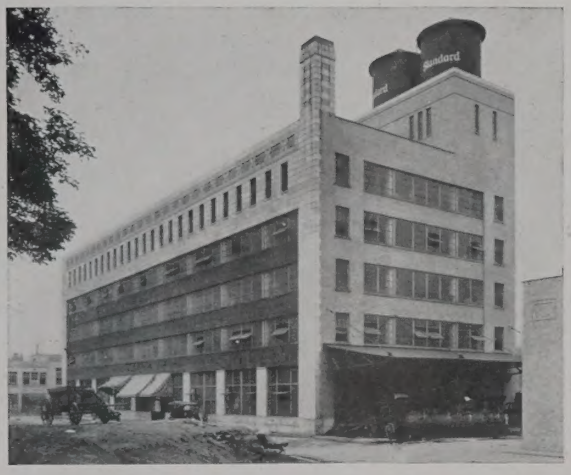
Aberthaw Construction Co., Contractors

Designed by Owners

Pierce-Arrow Motor Car Co, Buffalo, N. Y.
Daylighted and Ventilated by United Steel Sash

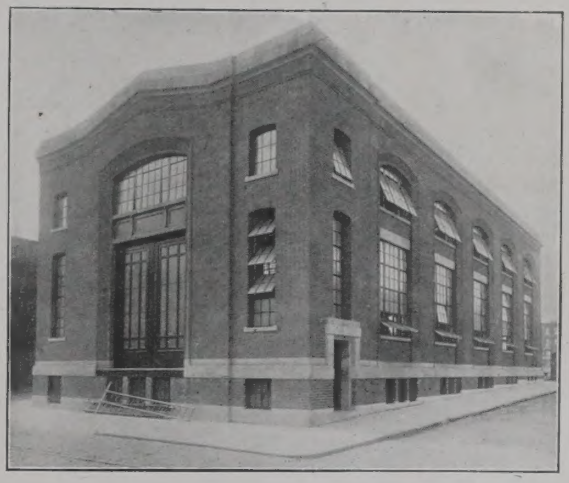


Bucyrus Co., South Milwaukee, Wis.
280 ft. Expanse of United Steel Sash.



J. Milton Dyer, Architect

Standard Manufacturing Co., Cleveland, Ohio.
United Steel Sash throughout.

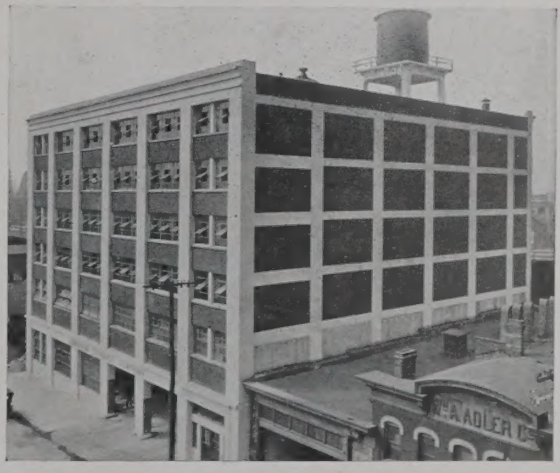


J. Horace Frank, Architect

Philadelphia Rapid Transit Co., Philadelphia, Pa.
Large windows of United Steel Sash

Parkinson & Bergstrom, Architects

Packard Service Building, Los Angeles, Cal.
Windows of United Steel Sash. Flat ceilings of Floredome Construction.



Lockwood, Greene & Co., Architects and Engineers

B. J. Johnson Soap Co., Milwaukee, Wis.
United Steel Sash and Kahn System Reinforced Concrete.

Chas. H. Byfield, Architect

Mansur Wulsin Building, Indianapolis, Ind.
The large wide ventilators are made possible by use of United Steel Sash. Entire Construction is Kahn System Reinforced Conctete.

Averill & Adams, Architects

Hale & Kilburn Building, Philadelphia, Pa.
Large amount of ventilation with United Steel Sash—Vertical Sliding Sash in first story windows. Pivoted Sash above first story

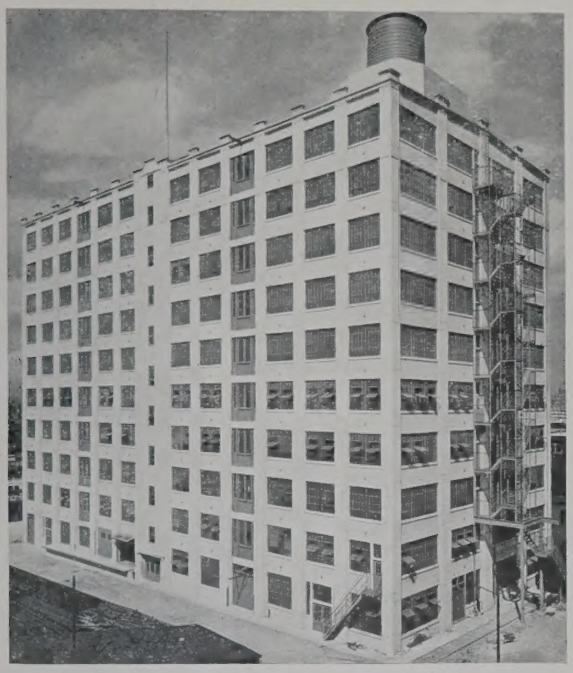
L. C. Holden, Architect

International Motor Co. Garage, New York.

United Steel Sash in all exterior walls and partitions

Ballinger & Perrot, Architects

Automobile Club of Philadelphia.
Maximum daylight and ventilation with United Steel Sash. Note attractive appearance of these sash.



Turner Construction Co., Contractors Charles Fall, Architect

Hoboken Land and Improvement Co., Hoboken, N. J.

Turner Construction Co., Contractors Frank J. Helme, Arch't

Turner-Carter Building, Brooklyn, N. Y.

United Steel Sash used throughout these two buildings.

W. F. Barlow, Architect

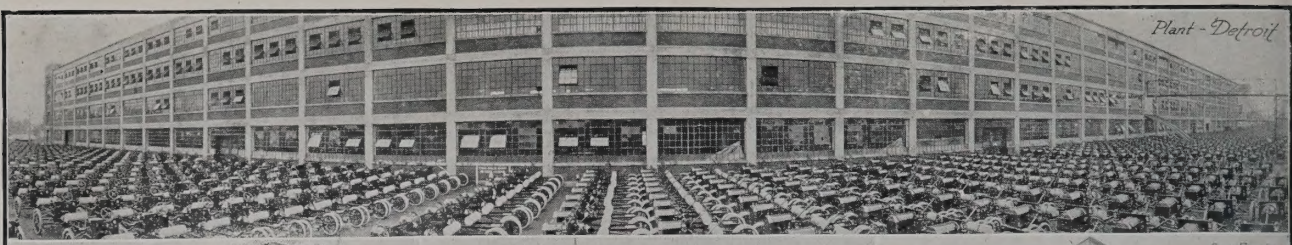
Brockton Merchant's Association, Brockton, Mass.

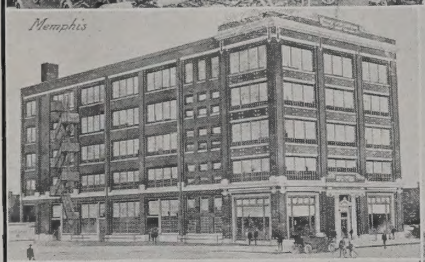
United Steel Sash used throughout.

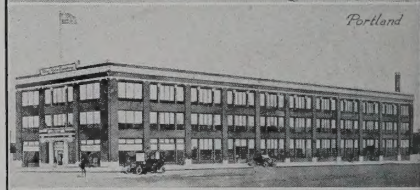
Weathers-Foley Co., Architect

The 12-Story Lotus Building, Memphis, Tenn.

United Steel Sash on side and rear
Kahn System of Reinforced Concrete throughout.



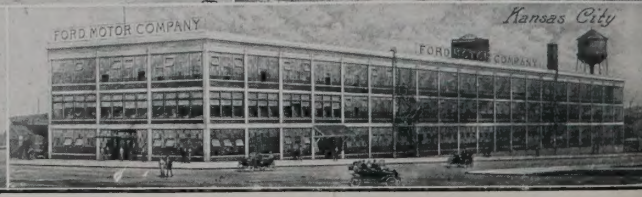




The Ford Motor Co. has adopted United Steel Sash in 41 buildings, including their immense plant in Highland Park, Mich., their factory in Walkerville, Ont., and service buildings in 21 different cities. The illustrations on this page give only a limited idea of the wide extent and the high character of this work. The 23 cities in which the Ford Motor Company has installations of United Steel Sash in their buildings are as follows:

Altanta, Ga.	Indianapolis, Ind.
Cambridge, Mass.	Kansas City, Mo.
Chicago, Ill.	Los Angeles, Cal.
Cleveland, Ohio	Memphis, Tenn.
Columbus, Ohio	Minneapolis, Minn.
Dallas, Texas	Oklahoma City, Okla.
Denver, Colo.	Portland, Ore.
Des Moines, Ia.	San Francisco, Cal.
Detroit, Mich.	Seattle, Wash.
Highland Park, Mich. (19 Buildings)	St. Louis, Mo.
Houston, Texas	St. Paul, Minn.
	Walkerville, Ont.

KAHN Building Products
TRUSSED CONCRETE STEEL CO



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